RADIO AND HOBBIES IN AUSTRALIA

FEBRUARY, 1940

Vol. 1, No. 11

RADIO

MODEL PLANES

SHORT WAVES

MAGIC

PHOTOGRAPHY

WORK SHOP

POPULAR SCIENCE

WORLD REVIEW

Etc.

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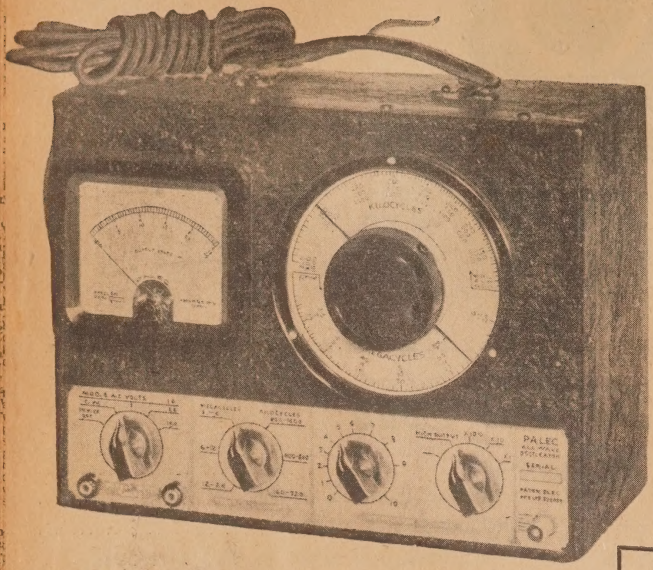
Oscillator v. Signal Generator



Regarding the principle involved, there is little fundamental difference between an Oscillator and a Signal Generator, yet prices range from approximately £10 to £150 and over—WHY?

Because the instrument selling in the latter price class is invariably a PRECISION INSTRUMENT, and—as precision is NECESSARY in commercial radio design and production—it is usual to PAY THE PRICE.

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With the Editor

THE joke about the average man's New Year resolutions is so old that it has almost ceased to be funny. We are all faced with a time sooner or later at which we decide to undertake a new course of action, even though our initial enthusiasm is not matched by our fidelity to it.

When you have read through this issue of RADIO AND HOBBIES you will have noticed many evidences of our own New Year resolutions. But unlike those of the man in the story, they have all come to fruition.

In the first place, we have reorganised the Answers to Correspondents section. From now on it will be our ambition to see that all your letters are answered in the first available issue of the paper. After all, a month is a long time to wait for advice, and in two months it will probably be quite useless.

We have gone even further. If you want an answer in a hurry, you can once again use the Postal Query Service. Unfortunately, although we have enlarged our staff this year, we are unable to make it a free service. However, we know from past experience that no one is likely to grudge the payment of one shilling, particularly when it means an answer within a few days.

Other improvements include a bigger and better Feature Story section in the first pages of the paper. We want to make this section of interest to everyone who buys RADIO AND HOBBIES.

NEXT MONTH:—

In the March issue of RADIO AND HOBBIES we plan to include something about amplifiers. So far, we have not done very much about this popular side of radio construction. However, we have been at it again, and hope to give you some valuable reading next month.

In our endeavor to make our paper better and better, we still want your advice and suggestions. Write to us about anything you like. If it is help you want, we will spare no effort to give it to you. By our co-operative effort RADIO AND HOBBIES is certain to go from strength to strength.

John Boyle

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CARTOON

HUMPERDINK TAKES A CAMPING HOLIDAY

A perfect spot! Soon get those "dead marines" out of the way.
Discovers half the flies in Australia are camping, too.
Wife soon fixes them. Humpy sees to the tent.
The open air! This is the life!
H-m-m! Must have a decent aerial.
Tackles tree with confidence and anticipation.
"O.K., my love! I'm all right—
I hope!"

The Return of Humperdink

IN the old days of "Wireless Weekly," round about six years ago, the famous Australian artist, "Wep" drew a series of cartoons entitled "The Progress of Mr. Humperdink." Evidently the publication of a Wep cartoon in our Christmas number has jogged the memories of many old readers. Why not give us "Humpy" all over again, they have asked! We can't very well do that, but we have decided to revive some of Humperdink's adventures for Radio and Hobbies, and we know that in doing so, we will give you again many a merry moment. In our opinion, these cartoons represent the finest work of their kind ever seen in Australia. Next month we will publish another Humperdink camping adventure.

MANUFACTURING SPEECH BY ELECTRICITY

BIG POSSIBILITIES FOR NEW INVENTION

A single Donald Duck singing a trio of tenor, baritone, and bass.

Bing Crosby crooning a number in three different keys at the one time.

Maurice Chevalier singing the same song in French and English simultaneously.

THESE are but a few of the wonders you are going to hear from the silver screen within the next 12 months. The magician which accomplishes this back magic is a machine called the Vocoder, the latest miracle in sound experimentation to be discovered by the Hollywood technicians.

The Vocoder, which is an invention of Mr. Homer Dudley and his associates in the Bell Telephone Company, is contained in a cabinet about seven feet high and square. Mr. Dudley says, "The Vocoder is an electrical instrument that investigates and analyses speech, and then proceeds to remake it in any form desired."

A simple statement that. But imagine the possibilities! To take a spoken phrase (or a sung phrase) and remake it in any form desired!

The heads of the major studios of Hollywood realise the enormous potentialities of this miracle machine. For last September a try-out was given, and the chief executive of every large studio found his way into the review room of Electrical Research Products Incorporated.

MAN SINGS TRIO

The first part of the demonstration occurred when a Mr. Charles Vandersen sang a trio. Putting it another way, his voice was given to the machine as a solo. It emerged through the loud-speaker as a trio! It was a simple matter of using his normal voice. Then he set a key which switched on another wire a few points below his own voice, and then a second which registered a few points above his own.

So far the device has developed but 30 ranges Still, that would seem sufficient to give pause to the musicians of the world. It touches every phase of music. It can build up or tear it down. It can do much on the serious side of entertainment.

And in the cartoon field?

The answer to this may be found in the fact that the famous Walt Disney himself was among those present at the demonstration. And his "Snow White" which many believed would stand for years as the peak of cartoon entertainment, was widely discussed. "Already," said Disney, "Snow White is passe. The possibilities that this new machine opens up in my particular branch of entertainment are endless." For now the Disney imagination really may run riot —with voices of witches singing as girls and hobgoblins crooning a la Crosby. And just imagine Donald Duck singing a trio!

OLD OR YOUNG?

The second demonstration occurred when Mr. Vandersen spoke in normal tones into the microphone, and the quavering voice of an old man issued from the loud-speaker!

Through records played on a turntable and attached to the Vocoder, the demonstration then proceeded to show that speech can be created out of complex sound. Examples used were the starting of a train, an aeroplane flying overhead, the musical tones of a pipe organ and the hum of a power generator.

Uncanny and magical was the creation of words from the purring aeroplane and the train; but most amazing were the word accompaniments created by the Vocoder from musical instruments. A pipe organ record suddenly transformed the treble notes of the chorus into easily recognisable words—and the exact words of the song itself!

HOW IT WORKS

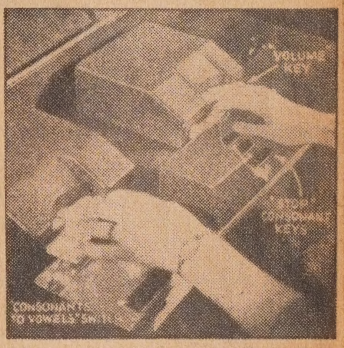
So much for what this extraordinary machine does. Now—how does it accomplish such magic?

Let Mr. Dudley, the inventor, tell you. "Usefulness of the Vocoder in speech studies lies in its ability to vary, singly or together, each of the elements of speech," he says. "The raw material of speech is two streams of sound. The proper variations of these two streams give us intelligible speech.

"The first sound stream is character-

(Continued on Page 9)

H. W. Dudley (right) controls inflection of C. W. Vandersen's voice. Arrow points to Vosyn's loudspeaker.

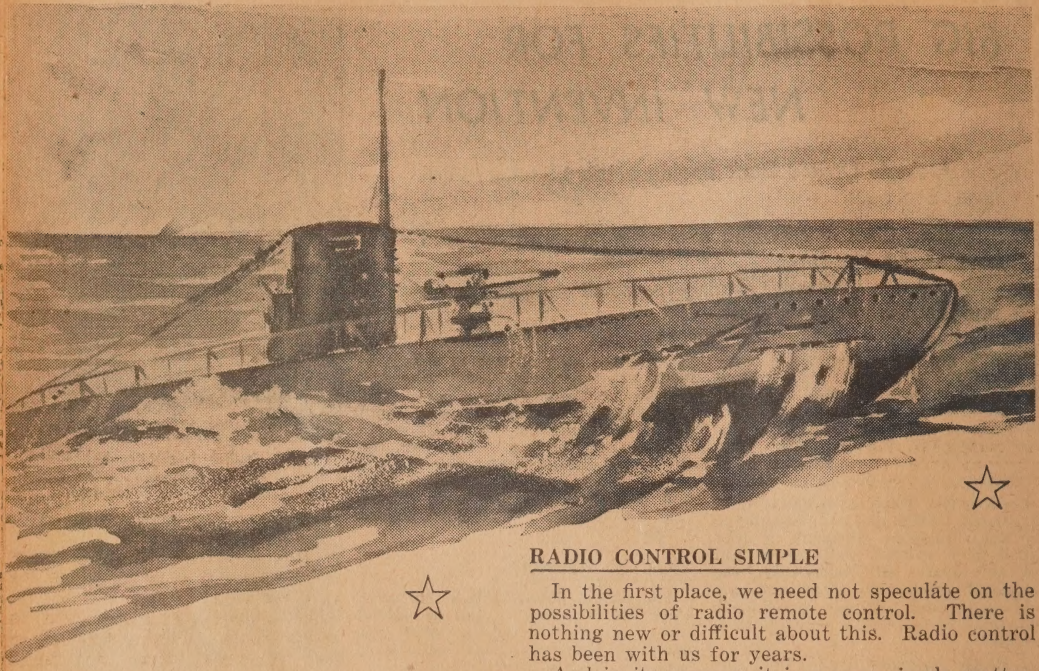


Earlier work developed the "Voder," a keyboard instrument for manufacturing speech. Here is an operator at work.

Right—
A close-up view of "Pedro the Voder." Ten of the white keys each controls a speech sound. The 3 black keys make the "stop" consonants.

FEATURE STORY

WAS THE H.M.S. COURAGEOUS SUNK



ONE of the main naval events of the war has been the sinking of the British aircraft carrier, H.M.S. Courageous, by a German submarine. Everyone is now familar with the details of the case, and realises what a tragic business it was.

One thing which has puzzled many however, is the fact that the submarine managed to get close enough to the Courageous to do its work. Naturally, such things are likely to happen by chance, but the possibilities of another explanation is always to be considered.

In other words, was the job done by a cleverly laid scheme which operated according to plan? Was it in fact, a venture worked out beforehand, with which chance had no connection?

A ROBOT SUBMARINE

We were very intrigued to read in a recent American journal, that the German short-wave wireless had claimed the sinking to be the work of a new robot submarine, operated by radio from another ship some distance away.

And that although the sinking of the submarine which did the damage was claimed, actually the submarine sunk was the robot, and not the main control vessel at all.

Whether this is the truth or not, may never be known. But it is interesting to examine the possibilities of such a scheme with a view to estimating whether or not it would be practicable.

RADIO CONTROL SIMPLE

In the first place, we need not speculate on the possibilities of radio remote control. There is nothing new or difficult about this. Radio control has been with us for years.

And in its essence, it is a very simple matter. It requires a transmitter at the control point, and a suitable receiver in the vessel to be controlled.

The object of the transmitter is to send out impulses in the form of radio signals. Each impulse operates a sensitive relay which is connected to the receiver. This relay is then made to switch on and off the apparatus necessary to control the submarine, aeroplane, or whatever is at the other end.

A very good analogy is found in the ordinary automatic telephone.

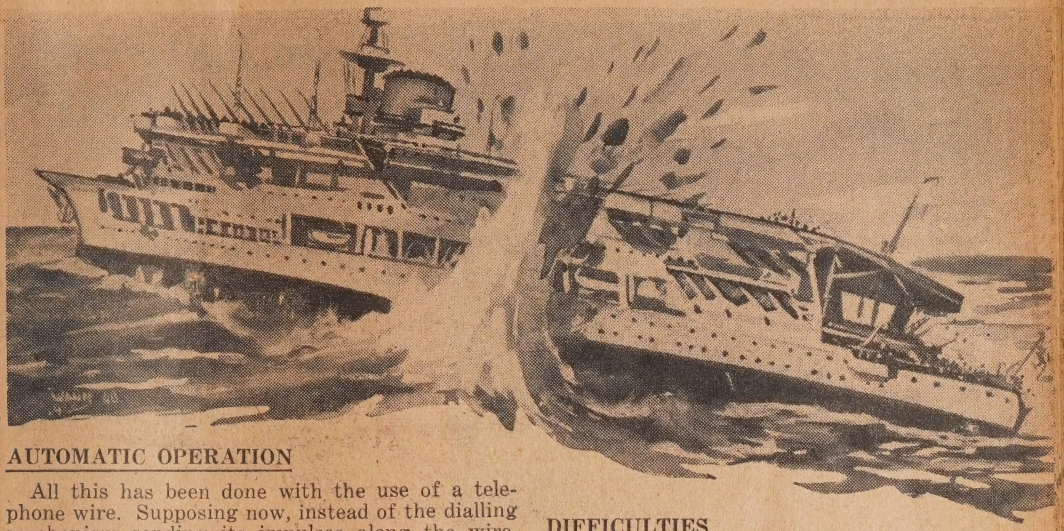
When you want a connection, you get it by dialing a series of numbers. Assume the first of these is 5. You revolve the dial in the normal manner, and when you release it, the mechanism inside the telephone sends out five small impulses of electricity along the wire to the switch board.

These five impulses move a small selector arm, controlled by relay, until it comes to rest in the fifth position of its possible travel. That is the first unit in your remote control dialling.

You proceed with your dialling until the required numbers are all included. The fact that some of them are letters doesn't matter at all—these are included just to make it easier to remember.

When the last of the numbers has been dialled, the combination allows a contact to be made through to the bell of your friend's phone, which commences to ring. You have in effect, called up your friend by the use of remote controlled switching.

BY A GERMAN ROBOT SUBMARINE?



AUTOMATIC OPERATION

All this has been done with the use of a telephone wire. Supposing now, instead of the dialling mechanism sending its impulses along the wire, they had been fed to a transmitter, which sent them out into the air as a succession of radio waves or impulses. And at the other end we had a receiver tuned to the wavelength, picking up the impulses.

Obviously we could make the whole circuit work exactly as before, except that a radio link has replaced a telephone wire link.

And supposing again, that instead of working a telephone exchange, when we dialled the number 5, we set into operation a small motor which turned the rudder of a submarine to the right. And if we dialled 6, it would operate another selector arm which put it straight again. And if we dialled 9, another motor would be switched in which made the submarine dive?

It is perfectly clear that we could control the movements of the vessel, simply by dialling the right numbers just as we would a telephone.

But is it practicable?

A system of control just as simple as this has been in use for some time by the British army in controlling the flight of a robot aeroplane. The officer in charge sits on the ground, and dials away at his control box.

The signals from the transmitter are picked up by the receiver in the aeroplane, and its controls are operated by the switching mechanism connected to the receiver.

So you see it would be possible to control a submarine by radio, and send it on any course the control operator desired it to take.

DIFFICULTIES

There are several difficulties which make it very unlikely that the robot submarine reported by the Germans ever existed.

Every receiver and transmitter must have an aerial for efficient operation. Taking first of all the control vessel—it must have an aerial out in the clear, and of the correct length for the wavelength used, if efficiency is desired.

Naturally, efficiency is desired, otherwise the submarine might get out of control, and start a voyage on its own.

Now a submarine is about the worst possible vessel for these conditions. In the first place, it has a steel hull in the water. Obviously any aerial inside the hull would be so thoroughly shielded as to be useless.

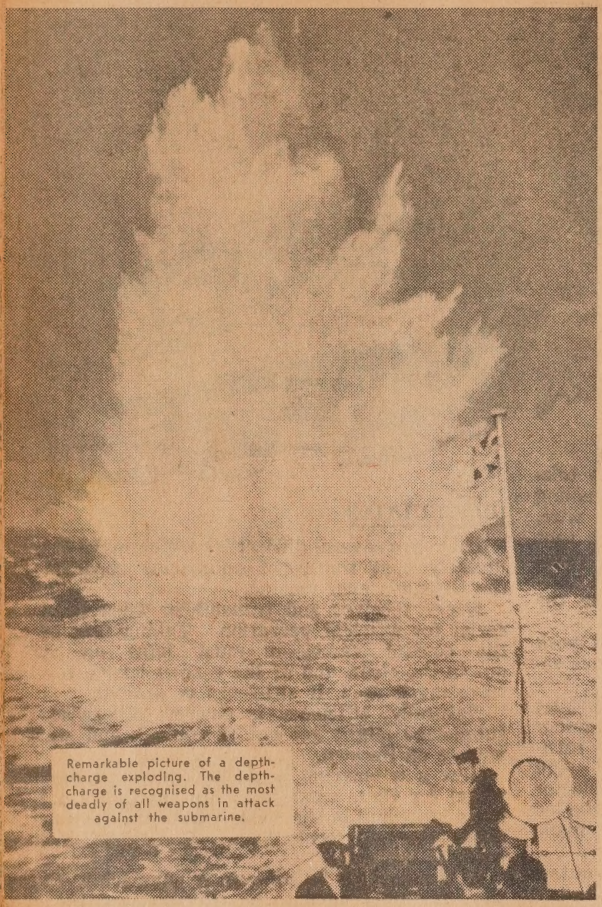
If the control vessel was a submarine, therefore, it would have to be travelling on the surface with its aerial mast exposed. Furthermore,

(CONTINUED ON PAGE 65)

According to an American report, the German short-wave wireless has claimed that H.M.S. Courageous was sunk by a robot submarine, controlled from another submarine some distance away. While it is most unlikely that this actually was the case, it is interesting to examine the possibilities brought up by this claim. This article endeavors to point out the difficulties of such a feat, particularly in its application to submarine warfare. The possibilities of radio control in other circumstances is also discussed, for such control is quite possible, and has been used experimentally for some time, particularly by the British Army in conjunction with the Royal Air Force.

HOW POWERFUL ARE MODERN EXPLOSIVES?

From FIREWORKS To BIG BOMBS



Remarkable picture of a depth-charge exploding. The depth-charge is recognised as the most deadly of all weapons in attack against the submarine.

"Explosives are only harmful when adapted to harmful purposes," says Professor Haldane, in this article which originally appeared in a London paper. Scientists are able to control the effects of explosives to within very fine limits. Many different substances are used in their preparation.

By Professor J. B. HALDANE

IT is a good general rule that the more we know of a thing the less we fear it. So to win the war we had better understand as much as we can about the scientific principles involved.

Let us begin with explosives. They are used for three purposes, as propellants to make bullets and shells move quickly; for the destruction in high explosive shells, torpedoes, mines and bombs; and for scattering in shrapnel shells, where a small charge drives the bullets out so that they fall over a wide area.

The first explosive was gunpowder. This is a mixture of three substances, saltpetre (potassium nitrate), charcoal (carbon) and sulphur, none of which is explosive alone. But the potassium nitrate is mildly unstable, and can easily give up some oxygen to burn the carbon and sulphur.

In fireworks the nitrate is often replaced by a chlorate of some metal, which also gives up oxygen easily. The I.R.A. terrorists used potassium chlorate.

In 1914-1918 the French used an explosive called cheddite, which is easily made where large amounts of hydro-electric power are available, and contains ammonium perchlorate.

In the nineteenth century a new type of explosive was produced. This is not a mixture, but a compound, that is to say, a substance in which all the chemical molecules are of the same kind.

In gunpowder the carbon is in one molecule, the oxygen in another. In nitro-glycerine the carbon and oxygen are in different parts of the same molecule, and have a much smaller distance to move before they can unite. In Marxist terminology the internal contradiction in the explosive is further developed, and the effect when it is resolved is more violent than in the case of gunpowder.

Every explosive acts in the same way, by suddenly generating a big volume of hot gas at high pressure. Something has to make way for it. But there is a fairly sharp distinction between "low" and "high" explosive. A high explosive may liberate less heat and less gas than a low explosive, but it does so much more quickly.

When a soldier fires a rifle he starts a rearrangement of the atoms in the cordite filling of his cartridge. This liberates hot gases, which drive the bullet forward. But they are given off relatively slowly, and are still being formed when the bullet is halfway along the rifle barrel.

If a traitor had substituted a high explosive, such as gelignite, for the cordite in the cartridge, much the same amounts of heat and gas would be produced. But they would be produced almost instantaneously, and would cause such a high pressure as to burst the rifle barrel and probably kill the soldier.

On the other hand, the pressure on the bullet would be over in such a short time that it would not leave the rifle at as high a speed as with cordite.

So low explosives such as gunpowder and cordite are used for propellants, and in land mines, where the object is to lift a large volume of earth rather than to shatter a small volume. For most

other purposes high explosives, such as trinitrotoluol, are used.

Another distinction among explosives depends on the method of setting them off. Some explosives, such as gunpowder and mercury fulminate, are set off by a spark. Others, such as guncotton and trinitrotoluol, are much harder to start off, and this is usually done by a detonator, containing a small amount of a sensitive explosive.

There is no necessary connection between the ease with which a substance can be got to explode and the violence of the explosion.

A very large amount of work has been done on explosives, and scientists who have worked on them are blamed for making war more terrible. This is a false accusation. Modern wars are terrible because transport enables millions of men to be concentrated in a single battle.

If explosives had never been invented, and the Germans had invaded Poland with swords and spears, there would be just as much bloodshed as there is to-day, provided they had motor transport. If the Siegfried Line was a wall like the Roman wall in Northumberland, it would be a formidable obstacle if it were defended by millions of soldiers against an army without explosives.

And without explosives, many forms of mining and quarrying would be impossible. Indeed, mining has had as much influence as war on the development of explosives. Explosives are not good or bad in themselves. They are good or bad according to how we use them.

NEW "HOT" LIGHTING FOR TESTING

AN artificial lighting bolt which imitates natural lightning in its ability to set fire has been created. It differs from the conventional artificial bolt in having a low-amperage, long-duration stroke, following the main and leader lightning discharges, similarly to natural lightning.

Although the heat of ordinary artificial bolts is intense and they have enormously destructive explosive effects on whatever they hit unless it is adequately protected, they do not last long enough to set fire to combustible targets, only leaving a scorched hole. The after-stroke of "hot" lightning generates temperatures only half as high as the mai nstroke, but it lasts between 100 and 1000 times as long.

The long-duration charge is produced by means of additional capacitators, or a transformer from which the charge is "soaked" through a series of resistance and inductance coils in oil, and permitted to follow the initial high current discharge relatively slowly.

In demonstrations, "hot" lightning fused sand in a fibre tube, set fire to cotton cloth, and burned holes through copper sheets varying from one thirty-second to one-sixteenth of an inch thick.

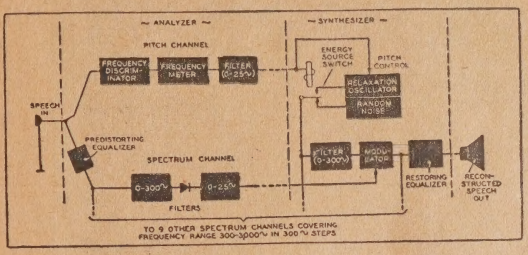
MAKING SOUND FROM ELECTRICITY

(Continued from Page 5)

ised by three properties; it has a pitch which is determined by the fundamental frequency of vibration; it has an intensity which is determined by the total sound power issuing from the mouth of the speaker, and it has a quality which is determined by the relative amounts of sound power carried in fixed frequency bands.

SECOND STREAM

"The second sound stream is characterised by having no pitch; it has a noise and has an intensity and quality which vary as the stream proceeds. During most of our speech, only one of these two streams is active at the one time."



Block diagram of the circuit by which e voice could be rais ed or lowered in pitch, given a fall ing inflection or a rising one, or made to carry on a dialogue with itself

Mr. Dudley proceeded to demonstrate the first mentioned sound stream, which he designated as "the Buzz." It was a full, rich note, something like a muted automobile horn. From this note, electrical filters picked out thirty different ranges of overtones covering the gamut of the human voice.

The same filters then broke down the second stream—the hissing sound—into thirty ranges. The different sounds in their proper proportion form all sounds of speech. These can be mixed by finger controls on the machine.

EXPERIMENTS

What Mr. Dudley was demonstrating was a circuit which analyses a voice into thirty parts and then uses the results to control the proper amount of each of the sounds before they reach the loud speaker.

After letting his audience hear a test sentence before and after it had been broken down and put together, Mr. Dudley showed how it would sound when the buzzer alone was used and its pitch was held constant—a flat monotone like a chant. By releasing the pitch so it could follow the speaker's voice, more naturalness was secured.

Normal speech was converted into a whisper when the hiss was substituted for the buzz. While the hiss is relatively faint, it is essential in discriminating between such words as "church" and "shirts," as was then demonstrated.

Expression, said Mr. Dudley, is due to the constant swinging up and down of pitch as one speaks. When the swings are cut in half, the voice seems flat and "expressionless"; when the swings are twice normal, the voice seems more brilliant; when four times normal it sounds febrile, unnatural. The controls can be reversed so that a high voice b comes low, a tune of a song unrecogni able, and ordinary English speech c be adjusted to any pitch required.

For comedy purposes, a male star ma with this instrument, go through a entire picture talking a high falsett or more amazing still, one actor m play half a dozen parts ranging fro the tone of a quavering old man to t high soprano of a choir boy!

So much for pictures.

But what of radio?

"No one can say quite what effe this machine will have upon radio," sa Mr. Dudley. "For instance, in a rad play and by the aid of this machine, will be quite possible for one actor play eight or nine different parts in t one production. This, of course, includ even singing a quartet with his ow voice.

"Again, the studio which possesses Vocoder need never worry about a las minute non-appearance of an actor. T missing player's voice can be faked f any other member of the cast, male female."

SOUND MIRACLES

In the past engineers have accon plished miracles with sound. One the outstanding examples occurred la year in connection with a Constan Bennett film. The name of a real a living personage was inadvertently use and this was not discovered until t picture was ready for release. So e gineers drew a fresh series of sou graphs of another name, photograph these, and cutting out the offendi name, spliced the new one into t sound track! But the Vocoder promis to bring about even more remarkab results.

WHAT MAKES THE LEAVES TURN BROWN?

THE SECRETS OF AUTUMN'S COLOR

There is a song the words of which begin, "I think that I will never see a poem as lovely as a tree." The author of those words had a soul. For I think that there is nothing that mankind should so venerate in all the plant world as the kindly old trees, which (one can almost say who) serve us in so many ways to make our life a little happier.

"Leaves—just leaves!" With spring and summer gone, the dead leaves lie in colorful heaps, to be consumed at last in autumn's fragrant fires.

ONE has only to think and look upon the never-ending delight of the beauty of a tree's foliage. Its branches which afford us shelter, fruit or nuts that supply food, and wood which gives us the wherethal to build our houses, make furnire and give us fuel.

Yet, for all this, it is a sad and, alas, mmon sight to see the axe wantonly stroying this wonderful gift of nature no purpose whatever. One of these ys the authorities, who are supposed look after the welfare of the people, ll realise the untold harm that comes m the destruction of our trees.

Already there are cries of soil erosion, cause there are no trees to bind the l together with their roots. No trees here trees once stood. Trees that re cut down because someone wanted build a house that could have been ilt somewhere else. Trees destroyed to make way for a roadway that could have been built through them.

But enough of this. I do not propose to start a controversy. One must get these things off the chest, however, while the opportunity is ripe.

TREE BY-PRODUCTS

The number of by-products of trees is astounding. Consider the following list. Fruit, of course, and nuts, paper, cork, timber, coffee, chocolate, cocoa, cloves, spice, sago, nutmeg, mace, rubber, cinnamon, olive oil, coconut oil, almond oil, maple sugar, camphor, quinine, turpentine, gum, balsam, resin.

In addition to these valuable by-products, the tree is absolutely necessary for the preservation of the health of the community inasmuch as the leaves purify the air by the absorption of carbon dioxide, and the giving off of that vital element of pure air, oxygen. But more of this anon.

The largest and oldest of living things are found among trees. Some of the giants are the sequoias of California, which reach a height of over 300 feet. Then there are the eucalyptus trees of Australia, which also grow to enormous heights. Some of the sequoias are believed to be over 5000 years old. In fact, it is believed by a few botanists that trees will not die of old age, but only by injury or disease. Or perhaps they are unfortunate enough to grow around Sydney when they die by means of the woodsman's axe.

CELL STRUCTURE

Trees, like all other living things, are composed of cells, and grow by the multiplication of these cells. Each year the tree increases its girth by the addition of a layer or cylinder of tissue called vascular tissue, which contains the ducts and vessels that enable the sap to feed the wood. These layers can often be seen and counted in a fallen trunk, when some idea of the age of the tree can be obtained. One layer for each year of age. In the animal skeleton the substance that stiffens the bone and enables the animal to stand up is lime. In trees a similar necessity arises in order that the tree can withstand the enormous strain of supporting its trunk and branches. But the substance that gives this stiffening of the wood is called cellulose.

Cellulose is formed by the combination of carbon-dioxide taken in by the leaves, water from the ground and the energy of sunlight. It is denoted by the chemical symbol $(C_6H_{10}O_5)_x$ or

carbon six parts, hydrogen ten parts and oxygen five parts.

This cellulose is the wall of the growing cell and starch is also formed, which is stored in the cells. The cellulose of certain plants furnishes us with cotton, linen, jute, and paper. Commercial starch is derived from wheat, oats, maize and potatoes, which contain this substance in abundance.

Coming now to the leaves of the tree. If a leaf is examined it will be found to consist of a network of veins. These veins in addition to acting as a support to keep the leaf spread out, also are "blood vessels," which connect every portion of the leaf with the roots.

CHLOROPHYLL FOR COLOR

In between the veins is a lower and upper membrane, which is filled with cells containing a green colored matter called chlorophyll.

As the sunlight strikes the upper membrane of the leaf, which, incidentally, the leaf keeps exposed to the sun, tiny mouths called stomata, in the lower membrane, admit small quantities of air. The chlorophyll takes from the air the carbon-dioxide, which is really an impurity of the air and a product of our breathing, &c.

Carbon-dioxide being soluble in water is absorbed by the water from the roots, and with the aid of sunlight the leaf manufactures the cellulose and starches and sugars which are the bases of all plant foods.

SUGARS AND STARCHES

The surplus oxygen is discharged to the outside air and the sugars and starches are passed through the veins and stem of the leaf and unite with other chemicals in the sap in order to build up the cellulose mentioned above.

The tree must also perspire just like a human being for there is a considerable amount of surplus water in the leaves when the tree is not drawing up water and the leaf is not taking in air. This surplus is "perspired" through the same mouths that take in the air and thus the leaf is able to keep cool and withstand the burning rays of the sun.

It is interesting to note that the leaf of a plant is always of a shape that will admit the greatest amount of sunlight according to the general shape of the tree. The upper surface of the leaf will always turn towards the sun and will turn with the passage of the sun across the sky.

ABSORBS CARBON-DIOXIDE

From the above it can readily be seen why it is so necessary to conserve as much as possible of our tree life. Let us look at it in the following manner. The plant takes in carbon dioxide, uses the carbon to build itself up with. The materials of the plant bodies are eaten by men or animals and so built into human or animal tissue. This tissue is then used up in living and its energy released, carbon dioxide being released in breathing, &c., and the circle is complete.

And the more trees, the more carbon di-oxide used and the purer the air.

By
CALVIN WALTERS

In autumn the leaves of deciduous trees fall. These trees are resting and in order that no energy be expended in keeping the leaves alive during this resting period the tree grows a corky layer between the twig and the base of the leaf stem. This prevents a wound when the leaf falls. Previous to the formation of this corky layer the Chlorophyll is drawn back into the body of the tree, leaving various sugars that the tree has no use for sealed up in the leaf.

Chlorophyll consists of two coats, one green and one yellow. Consequently when the green coat is withdrawn into the tree, the yellow coat is left behind. This yellow is called Carotin and is the yellow in carrots. This gives us the yellow of the autumn leaf. The rich reds and lavenders are caused by the oxidation of the sugars and a substance called Flavone produces a brown coloration. Tannin also gives brown.

Whatever makes for abundant sugar gives the best autumn coloration, such as maples and birches. When the change from summer to winter is abrupt with early frosts, there is more sugar in the leaves, since the leaves have been constantly at work with no gradual diminution of activity.

CLIMATE AND COLOR

Bright days produce sugar and are also more likely to be followed by frosts than are cloudy days. Thus all countries such as Eastern Canada and New Zealand enjoying a climate such as t have conditions that are ideal for production of magnificent autu foliage.

Summer ends abruptly and autumn bright. For those chemically inclin there follows a list of the names of st stances giving the various coloration

Brown: Phycophaein and Tann Blue: Alkaline Anthrocyans. Gree Chlorophyll. Red: Phycoerythrin, Yyo persicin and Anthrocyans. Yellow a Orange: Carotinoids and Anth xanthins. Violet: Neutral Anthrocya

Of course, in a short article such this, it is impossible to give an accou of the operation of all parts of the tr such as the roots, but I trust that t above will give readers some idea the most important aspects. In co clusion, if you are ever tempted to out the axe, I would like you to co sider the following.

Trees perform an indispensible serv to mankind and the land. They defe the soil against waves and floods. forest regions the temperature is m equable and the atmosphere moister th in treeless regions and the air is pur

Trees have a tremendous influence the fertility of the soil. The leaf mo produces one of the richest soils whi absorbs and retains moisture well. Th the forests act as reservoirs of ra water from which it drains slow Regions that have been deforested a visited by infrequent torrential rai are subject to destructive flood a droughts, and tend to become deser like parts of China and America.

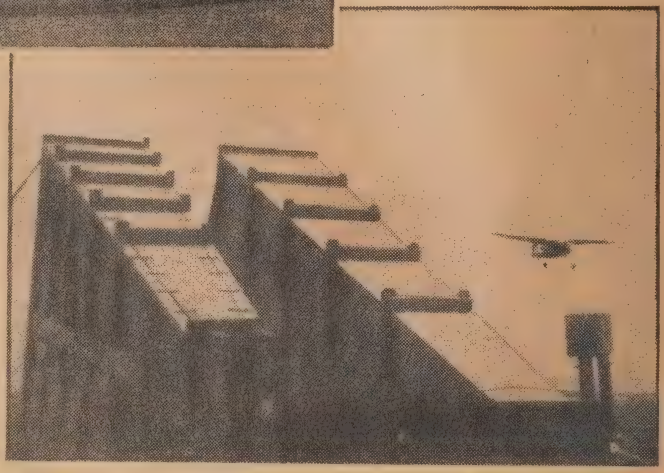
The long roots of trees are able tap underground water sources and t wide spread of the foliage gives an enormous amount of moisture a shelter for man and cattle.

To repeat an old and wise sayin "Woodsman, spare that tree."

A group of leaves showing the gradual change from original green to complete disintegration

The TECHNICAL

Below—the two horns viewed from the side. The axis of one horn extends at an angle of 5 degrees to the airport surface, the other at 10 degrees. The overlap region between the flat horizontal signal radiated from them constitutes the signal followed in landing the plane.



Below—the test plane making an approach to the field, following the indications of the landing instruments. The horns are situated to one side of the landing path. The signal regions radiated are inclined to and nearly parallel to the airport surface.

40 CENTIMETRE WAVES FOR PLANE BEACONS

The importance of air travel is reflected in the ceaseless endeavors of engineers to make it safe for all. In the last few years, the development of landing beacons has been probably the most important in this respect. This article, taken from "Electronics" for November, 1939, explains a new system using micro-waves of 40 centimetres.

RECENT progress in the field of the ultra-ultra high frequencies, above 500 mc., has consisted principally in the development of ore efficient generators, more sensi- ve detectors.

Behind the scenes, however, several ganisations have been working to- ard the application of the very short aves to the problems of aerial navi- tion and guidance.

One of the outstanding examples of is work is the collaboration between e Civil Aeronautics Authority and the assachusetts Institute of Technology a system of instrument landing hich employs 40 centimetre waves and hich makes use of nearly all of the odern developments in the field of icro-wave research.

The system is the solution of a prob- m proposed by a C.A.A. engineer, ving Metcalf, and developed in prac- al form by the electrical engineering partment staff of M.I.T., under Pro- ssor E. L. Bowles. The apparatus was cently demonstrated in experimental rm to C.A.A. officials at the East oston Airport.

BEAMS FROM HORN RADIATORS

The transmitting equipment operates a frequency of approximately 700 c. At such high frequencies, beams ay be formed by radiating the energy from horn structures of convenient dimensions.

Two such horns were used in the demonstration, each fed by a separate transmitter. The horns are wooden structures, about 26 feet deep, and 10 by 2½ feet at the mouth. They are lined with copper sheeting. At the end of each horn is a rectangular box which closes the throat.

Inside the box is a quarter-wave antenna which protrudes into the box directly from a coaxial transmission line. The length of the antenna is about 10 cms. (roughly, 4 inches). The 700 mc. energy radiated from the antenna is conveyed down the horn to its mouth, and there it spreads out in a flat, fan-like pattern, whose width is at right angles to the long dimension of the mouth of the horn and parallel to the ground. (This relationship obeys the rule for diffraction effects, namely, that the diffraction pattern spreads widest at right angles to the long dimension of the slit.)

Consequently, the horn generates a flat, nearly horizontal, beam of signal, inclined at a slight angle to the airport surface.

EDITOR'S WORLD REVIEW

Developments in other lands

Two horns are used, each fed with signals of the same frequency, one modulated at 150 cps., the other at 90 cps. The horns are set up so that the central axis of one makes an angle of 5 degrees to the earth's surface, the other an angle of 10 degrees.

The fan-like beams from the two horns overlap in a region which extends from about 3 degrees to 7 degrees. The overlap region constitutes a "hillside" of signal down which the plane glides to the airport surface. In the plane, the receiver tells the pilot when both signals (90 cps. and 150 cps. modulations) are received.

When both are received at equal strength, the glide angle is 7.5 degrees, which is somewhat steep for most aircraft, hence the receiver is set to indicate the proper position when the upper beam is received somewhat stronger than the lower, producing a normal glide angle of from 3 to 4 degrees.

The arrangement just described gives so-called "vertical guidance," that is, it guides the plane in the up-down direction. Similar guidance in the horizontal or left-right direction is also necessary. In the demonstration the horizontal guidance was provided by a conventional long-wave runway localiser transmitter, designed and operated by engineers of the Washington Institute of Technology. When the C.A.A.-M.I.T. system is completed, the horizontal guidance may be set-up by 40-cm. waves in the same fashion as the vertical guidance.

The 700mc. GENERATORS

The horn structures just described are highly directional (in the plane of the fan pattern), and hence conserve the energy fed to them from the transmitter proper.

For this reason, very small amounts of transmitter power will suffice, so long as the receiver in the plane has adequate sensitivity. Two possibilities arise—a transmitter of several hundred watts power may be used with an insensitive receiver, or a few watts of transmitted power may be used with an elaborate receiver. The low-power arrangement was used at the demonstration, although the high-power method has been tested with success.

BEAM TYPE

The generation of hundreds of watts of power at 700 mc. has been possible only since the advent of the beam-type of cathode-ray generator. One of the "klystron" generators originated at Stanford University was available for the purpose, and was set up in operating condition on the airport, mounted in a truck complete with high voltage power supply and a continuous vacuum-pumping system.

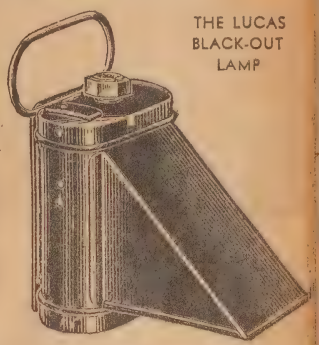
With less than 100 watts output, in previous tests, adequate signal strength was received in the plane at a distance of more than 25 miles, which constitutes a record for micro-wave transmissions. In the demonstration, however, it was more convenient to use lower power, and to rely on the high sensitivity of the receiver.

TRIODE OSCILLATORS

Accordingly, two conventional triode oscillators were used, one for each horn radiator. The oscillators employed the Western Electric type 316A door-knob tubes in coaxial-line tuned circuits, and were fed with about 25 watts of power, one modulated at 90 cps., the other at 150 cps.

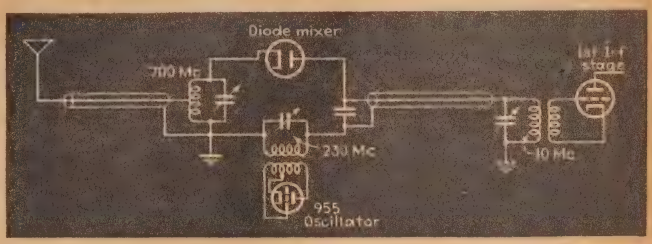
The output of the oscillators was in the neighborhood of one watt at 700 mc. (43 cms.), but even this small power was adequate to produce a strong signal at distance greater than five miles. Since the glide path to the airport surface is usually less than five miles long, the performance was satisfactory, despite the very low power of the transmitters.

BLACK-OUT LAMP

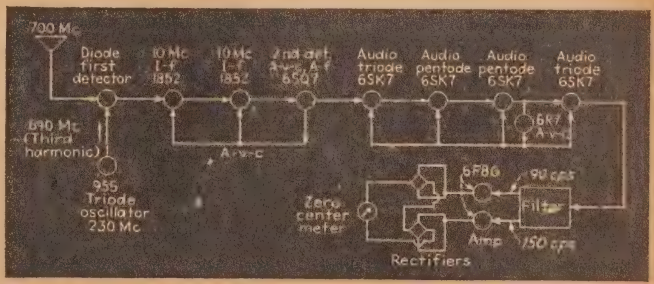


THE LUCAS BLACK-OUT LAMP

THE black-outs in London have led to the development of this special electric lamp. A long fixed hood, white enamelled inside, throws a diffused light downwards, and a spring loop clip at the back holds the lamp to the belt or pocket. A spare bulb is carried, and a standard two-cell cycle battery used



The diode first detector in the Superheterodyne receiver. Circuits tuned to the signal frequency, the oscillator frequency, and the intermediate frequency are connected in series with the diode, which develops the third harmonic of the oscillator output and mixes it with the signal, simultaneously.



The valve line-up. Two 700mc. signals, modulated at 90 and 150 cps., respectively, are amplified several hundred thousand times before separation in a filter, and applied to the indicating meter.

UILDING AN EXPONENTIAL LOUDSPEAKER HORN

It is not often that a complete article "makes" our review pages. This description of a loudspeaker horn which appeared in the December issue of Q.S.T. is so good that we decided to reprint it in full. We have seen horns in commercial use, roughly about the size of this one, and have been impressed with the results. The clear instructions given here should make the work easy.

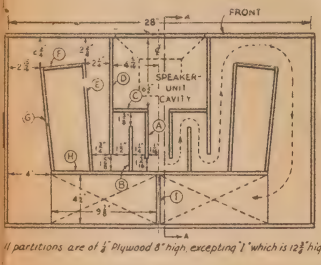
Here is the completed horn with a radio set standing on top. The high notes are radiated from the grille at the top, and the low notes go round and round and come out the bottom!

HEN the family budget won't stand for two radio receivers in the house, and the ham communications receiver can't be sacrid for a high-fidelity b.c. receiver, ething must be done to keep the le woman happy. We think we have answer, because, with a half-way ent 8-inch speaker and 2 watts of lio from the receiver, we have b.c. eption worth showing off to the neighs, and—more important—it didn't n the budget.

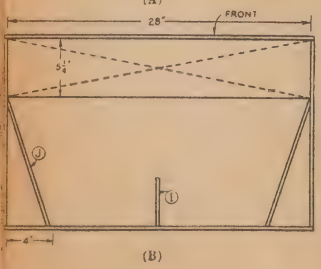
et's first consider the characteristics the dynamic speaker. Ordinarily, a d dynamic will provide good response to 5000 cycles, and, with a baffle at st 8.5 feet in diameter, is supposed get down into the lows somewhere und 30 cycles, theoretically.

FFLE IS BULKY

Unfortunately, the baffle arrangement two disadvantages—the bulky size



(A)



(B)

A" is a plan view of the top section. B" is a plan of the centre section.

where space is a premium, and the poor efficiency of the cone of an 8-inch dynamic speaker trying to shake air into activity at low frequencies where our ears are relatively insensitive.

The problem, therefore, is to get an arrangement that will get down to the low frequencies without the handicaps of a baffle.

Fortunately, one of the characteristics of the dynamic speaker is that at low frequencies the cone acts very nicely as a piston. As the frequency goes up, the cone finally ceases to act as a unit, with the result that only a small part of the cone around the voice coil is doing the major part of the work.

These facts fit our auditory requirements very nicely, for the air is practically incompressible at the higher frequencies and air columns can be set into vibration quite easily.

At the extremely low frequencies, the air is compressible to some extent, and the sound waves spread considerably after leaving the speaker, resulting in a reduction of the intensity of vibration. At the same time, the ear is much less sensitive to low frequencies, so that it becomes necessary to increase the actual amplitude of the air waves in order to hear them satisfactorily.

There are two common methods of setting a proportionately larger amount of air into vibration at the lower frequencies. The response of the audio amplifier can be adjusted so that the low frequencies are accentuated, but the increased amplitude of the cone movement tends to lead away from linearity, producing some distortion, and such an increase in amplitude takes considerable audio power.

The other method is to increase the effective piston area of the cone, thus creating a greater displacement of the air with the same piston amplitude. A large effective area can be obtained either by use of a large dynamic speaker or by using a small speaker with an exponential horn.

SPEAKER SIZES

In considering dynamic speaker sizes, we find that the high-frequency response tends to drop off as the size of the cone is increased. Thus, if we want a speaker large enough for good bass response, we have to sacrifice the highs. On the other hand, an 8-inch dynamic will give us good response up to 5000 cycles, and, with the aid of an exponential horn, we can get very good bass response.

The exponential horn has three general dimensions which determine its re-

DIMENSIONS

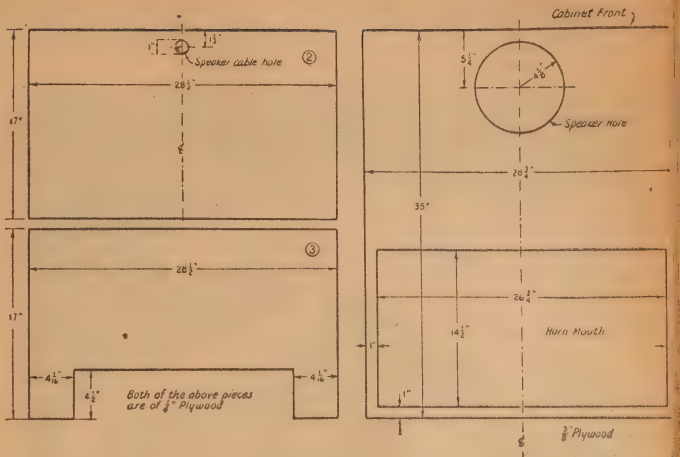
A—4 5-16 inches by 8 inches.
B—4⅛ inches by 8 inches.
C—3¼ inches by 8 inches.
D—10⅜ inches by 8 inches.
E—9 15-16 inches by 8 inches.
F—3 13-16 inches by 8 inches.
G—9 9-16 inches by 8 inches.
H—20 inches by 8 inches.
I—4½ inches by 12¾ inches.
1—17¼ inches by 28¾ inches, ¾-inch thick.
2—See Fig. 2.
3—See Fig. 2.
4—28⅛ inches by 11¾ inches.
5—28⅛ inches by 9 1-16 inches.
6—28⅛ inches by 18 inches.
7—17¾ inches by 28¾ inches, ¾-inch thick.
8—28¾ inches by 35 inches, ¾-inch thick.
9—See Fig. 2.
All pieces ¼-inch thick unless otherwise noted.

sponse characteristics. The throat area coupled with the size of the cavity between the diaphragm and the throat determine the highest frequency that will pass into the horn.

The rate of expansion of the horn determines the lowest frequency that will travel down the horn. The mouth area of the horn determines the lowest frequency that will enter into the air without reflection, caused by what might be called a mismatch of impedances.

The dynamic speaker on the ordinary baffle works very nicely down to around 200 cycles before the response drops off, so that a frequency in this neighborhood will be the highest that need pass down the horn.

The lowest frequency that we would like to hear (if possible) is around 30 cycles, so this determines our rate of expansion. To keep within reasonable outside dimensions we will make our horn mouth area 385 square inches, which gives a low frequency of 80 cycles before reflection takes place.



Details of pieces No. 2 (upper left), No. 3 (lower left) and No. 9 (right).

LOWER LIMIT

With these limitations, we can expect to get a low-frequency response such that the lower limit will be between 30 and 80 cycles, depending upon the acoustic characteristics of the room in which the horn is placed. Again, referring to the piston effect of the cone, we see that we now have an effective piston area of 385 square inches, which is about ten times the area of the cone of the 8in. dynamic speaker, or equivalent to a 22-inch diameter dynamic speaker.

For those interested in the mathematical design of an exponential horn for a dynamic speaker, reference to the "I.R.E. Proceedings," of October, 1936, and "Radio Engineering," by F. E. Terman, will give all the necessary data and references from which calculations can be made.

The photograph gives the general appearance of the finished speaker cabinet which is the exponential horn in disguise. The grilles were left off so that the beginning and ending of the "works" could be seen. With the exception of a 1-inch cavity between the top of the horn proper and the top of the cabinet, the entire space is taken up by the folded exponential horn. The cabinet is arranged so that the highs from around 200 cycles and up come directly from the dynamic speaker, and the lows from around 200 cycles on down come through the horn.

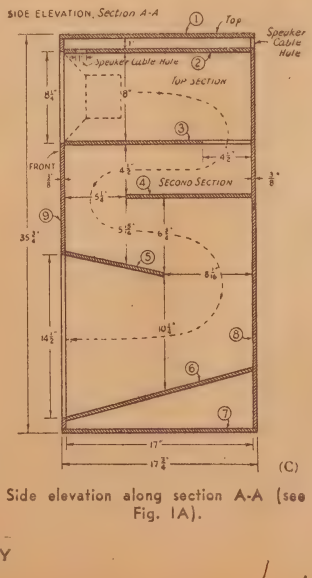
Fig. 1-A shows a plan view of the "top section" which also provides space for the dynamic speaker. The partitions are made of ¾-inch plywood. In this section, the horn is split into two paths so that use could be made of the entire space, these two paths joining together again at the back of the top section. Fig. 1-B shows the second section, plan view, and Fig. 1-C shows a side view of all sections.

CONTRUCTIONAL DETAILS

The tools required to make this cabinet consist of a hand-saw, hammer, plane, vise, chisel, and at least two small "C" clamps. The total materials used were two pieces of ¾in. plywood 4 feet by 8 feet, a piece of 3-8in. plywood 4 feet by 8 feet, some 1-inch brads, and glue.

First, cut all internal pieces to dimensions making sure that all pieces making up the labyrinth for the "top section" are all 8 inches high, that pieces No. 2, 3, and 4 have the same length, and that pieces No. 2 and 3 have the same width. The pieces (a), (c), and (d) are next assembled, using 1-inch brads and glue, making up two units which are identical in shape. Then, pieces (e), (f), and (g) are assembled to give two identical units which are then both attached to piece (h). The positions of pieces (a), (b), (c), (d), (e), (f), (g), and (h) are then laid off on piece No. 3, for both halves, giving a pencil-line outline that looks like Fig. 1-A.

Next, nail holes are laid off on piece No. 3 between the lines, which are ¾-inch



Side elevation along section A-A (see Fig. 1A).

apart, spacing holes about 1 inch fr the end of any partition. Lay piece 3 on top of piece No. 2 and drill holes with a No. 50 drill. Alongside lines drawn on piece No. 3, tack sm strips of wood so that the partiti will fit snugly, using enough strips hold the entire labyrinth in place.

Then, put slow-drying glue on edges of the partitions and on the pla where they are to be attached to pi No. 3, and nail the pieces (a), (b), (d), (e), (f), (g), and (h) in place. N remove the guide strips and repeat glueing process on the top edges of partitions. The piece No. 2 can then nailed in place, using the nail ho previously drilled, making sure th everything is being attached squarely place. The "top section" is then co plete.

The next step is to attach pieces to piece No. 4. As was done for the section, first lay off an outline on pi No. 4, to get something that looks l Fig. 1-B, and then mark off the n holes. Lay piece No. 4 on piece No which is the bottom of the "top sectio and bore the nail holes with a No. drill. Now pieces (j) can be attached piece No. 4, first, then to piece No. 3, w brads and glue.

THE SIDE PIECES

The sides are then laid out with pen lines to show the outline of the "shelv that are going to be attached. The sults should look like Fig. 1-C for left end of the cabinet, when facing cabinet, and the exact opposite for right side. After the positions of pie Nos. 2, 3, 4, 5, and 6 are drawn, r strips of wood, which are straight and long as the sides are wide, on the outs of the lines.

Try a piece of ¾-inch plywood betw the strips to make sure that there i tight fit. Now, with these strips guides, make sawcuts to a depth of 1 inch. Remove the guide strips and ch out the wood between the saw cuts get grooves which will take the ends the ¾-inch plywood "shelves."

(Continued on Page 75)

NEW LINE OF TWO-INCH VALVES

One of the most interesting news items this month is the announcement of some new midget battery valves in U.S.A. This article taken from "Electronics," gives full details of the valves. We would point out that these valves are most unlikely to be imported into Australia, as their advantages here appear to be limited. Our own experiments have shown that very similar results might be expected from the present 1.4 volt series operated with 45 volts high tension.

ECAUSE of the popularity of mid-
get receivers, there has been dur-
ing the last few years a gradual
reduction in tube size. However,
s in portable sets that small tubes
ear to have particular advantage.
advent of the 1.4-volt battery
es has made it possible to produce
able sets which are both efficient
economical in operation. With the
ntion of making possible further re-
tion in the weight and size of these
ivers, the RCA Mfg. Co. has devel-
four "miniature" tubes very small
e and highly efficient in opera-
with a 45-volt B supply.

AILABLE TYPES

hese new tubes include a converter,
io-frequency pentode, diode audio-
quency pentode and power output
tode, and provide a complete com-
ment for receiver design. This
cle describes the physical character-
s of these tubes, and briefly covers
electrical features of each type..
he design of the new miniature
es has been chosen to retain most of the economical manufacturing advantages of conventional tubes and at the same time to make possible tubes occupying a minimum of space.

A comparison of volume discloses that a tube of the new design occupies only about one-fifth as much space as the smallest conventional type, represented by the GT line.

ACTUAL DIMENSIONS

The diameter is slightly under three-quarters of an inch and the overall length is less than 2 1-8 inches. No base is used, but instead 0.040 in. wires from the seal serve as pin connections to the socket.

The stem is similar to the button stem which has been used in metal tubes for some years. The seven leads are arranged in a circle, with an eighth lead omitted to provide for base orientation.

A feature of this button type of seal is that it requires only about 1-8in. space from the top of the base pins to the electrode leads inside the tube. The leads within the tube are reduced in diameter, to facilitate forming them by machine for proper connection to the tube electrodes.

EXHAUST TUBE AT TOP

The exhaust tube is located at the top of the bulb. All of the types are of the single-ended construction; i.e., no top cap connection is used.

The grid and plate structures are identical in length to those of conventional 1.4-volt battery tubes. As a result, the same span of filament is available to provide comparable emission area. The reduction in tube length, therefore, is due entirely to the compact method employed to make connections from the electrodes to the socket terminals.

GOOD EFFICIENCY

Since the filament length is unchanged, the spacing from filament to control grid can be maintained the same as that of conventional types, and, as a result, the same efficiencies of operation can be obtained. In general, the grids have conventional dimensions. The plates, however occupy considerably less space, and, therefore, make possible the large reduction in bulb diameter.

These new tubes use the pins on each side of the missing eighth pin for their filament connections. The negative filament, pin No. 1, has tied to it suppressor grids and whatever shielding is incorporated in the tubes. Pin No. 1, therefore, is intended to be the ground connection. Pin No. 7 goes to the positive filament.

SPECIAL FOR PORTABLES

For portable radios, reduction of the space and weight of the plate supply battery is important. To make this reduction practical, the miniature tubes have been designed especially for efficient operation at 45 volts.

They may, of course, be operated at higher voltage with a corresponding improvement in performance, but their performance at 45 volts far exceeds that obtainable with conventional types.

With the exception of the output tube, which contains two filaments in parallel, the new tubes have a filament rating of 50 milliamperes at 1.4 volts.

A brief review of the electrical characteristics of these tubes will show some of their operating advantages.

TYPE 1R5 CONVERTER

The design of the miniature 1R5 converter type is based on that of the 6SA7. The use of this design principle provides much better performance at low plate voltage than any conventional pentagrid converter designed for the same low voltage. The 1R5 has a remote cut-off voltage of —9 volts and an improved oscillator transconductance of 1200 micromhos. At 45 volts, it is superior in performance to hitherto available battery type converters operated at 90 volts. This improved performance is obtained with a 50 milli-

ampere filament and no increase in B-battery drain. The high oscillator transconductance is of especial value for short-wave reception.

TYPE 1T4 R-F PENTODE

Internal shielding is incorporated in the 1T4 so that a bulb shield is not required. The grid-to-plate capacitance is less than .01 mmf. when the tube is used with a shielded socket. The 1T4 has a remote cut-off characteristic to provide optimum performance with automatic volume control if desired for this stage. The cut-off value matches that of the converter. The transconductance at zero bias is 650 micromhos with a plate current of 1.9 milliamperes.

TYPE 1S5 DIODE PENTODE

Consideration was given to the design of a diode triode, but the higher gain which can be obtained from a pentode at low B-supply voltage was an important advantage. The 1S5 will give about three times as much amplification as can be obtained with a triode designed to give ample output voltage for the grid of the power tube at the end of life point of 45-volt battery. Electron coupling and capacitance coupling between the diode and pentode sections have been kept at a minimum.

TYPE 1S4 POWER OUTPUT PENTODE

Although the other tubes are intended for operation at zero bias, a bias is necessary for satisfactory operation of a power output pentode. Since the bias required subtracts from the available plate supply voltage, every volt used on the grid is important when the supply is limited to 45 volts. At the same time the plate current must be kept low for good battery life. These requirements call for a tube of high efficiency and good power sensitivity. The 1S4, when operating on self-bias at a bias equivalent to —4 volts, gives a power output of 50 milliwatts, with only 3.5 milliamperes plate current.

TYPICAL RECEIVER PERFORMANCE

The following table shows the gains which have been obtained in a typical four tube receiver with a plate supply of 45 volts, at a total drain of 7.5 milliamperes.

Tube Number	Tube Type	Gain per Stage
1R5	Converter	25
1T4	I-f amplifier	60
1S5	A-f amplifier	35
1S4	Power amplifier	50 mw at 10% distortion.

To enumerate the possible applications of the miniature battery tubes would require too much space in this article. Many, such as hearing aids, meteorological work, portable sets for policemen, firemen, as well as general public will occur to the reader. With expansion of these applications, many of the component parts of the receivers will undoubtedly be reduced in size to take full advantage of the small dimensions of the miniature tubes.

NEW BATTERY VALVE DETAILS

RADIOTRON 3Q5-GT
BATTERY BEAM POWER AMPLIFIER
SERIES OR PARALLEL FILAMENTS

RADIOTRON 3Q5-GT is a beam power amplifier which may be arrange with the filaments either in parallel (1.4 volt 0.1A) or in series (2.8 vol 0.05A), the latter arrangement being intended for use in battery/A.C./D.C receivers. Reference should be made to the article, elsewhere in this issu regarding battery/A.C. receivers. It should be noted that release of informa tion regarding this valve type does not indicate its availability.

	Series Filament Arrangement*	Parallel Filament Arrangement**	
FILAMENT VOLTAGE (D.C.)	2.8	1.4	Volts
FILAMENT CURRENT	0.05	0.1	
MAXIMUM OVERALL LENGTH		3-5/16"	
MAXIMUM DIAMETER		1-5/16"	
BULB		T-9	
BASE		Intermediate Shell Octal 7-Pi	

SINGLE-VALVE AMPLIFIER—CLASS A.
OPERATING CONDITIONS AND CHARACTERISTICS:

	Series Filament Arrangement	Parallel Filament Arrangement	
Filament Voltage	2.8	1.4	Volts
Plate Voltage	90 max.	90 max.	Volts
Screen Voltage	90 max.	90 max.	Volts
Grid Voltage	—4.5	—4.5	Volts
Plate Current	7.5	9.5	Milliamperes
Screen Current	1.0	1.6	Milliamperes
Plate Resistance	110000 approx.	100000 approx.	Ohms
Transconductance	1800	2100	Micromhos
Load Resistance	8000	8000	Ohms
Total Harmonic Distortion	7.5	7.5	Per Cent.
Max. Signal Power Output	250	270	Milliwatts

*Filament voltage applied across the two sections in series between pins No. 2 and No. 7.
**Filament voltage applied across the two sections in parallel between pin No. 8 and pin No. 2 and No. 7 connected together.

PIN CONNECTIONS

Pin 1—No Connection.
Pin 2—Filament +.
Pin 3—Plate.
Pin 4—Screen.
Pin 5—Grid.
Pin 7—Filament (—for series operation).
Pin 8—Filament Mid-Tap (—for parallel operation)

(Pin numbers are according to RMA system.)

OPERATING POSITION.
Vertical or Horizontal—No restrictions.
Socket Connections: G-7AQ.

WHY NOT A SOLDIER'S SET?

A CORRESPONDENT to the English "Wireless and Electrical Trader" writes in that paper:—

"Being on active service 'somewhere in England,' I may possibly be out of touch with the latest developments to provide amusement and entertainment for the armed forces and the civil defence services.

"But, as a one-time member of the radio trade, I think the R.M.A. has been greatly behindhand in organising the production of a 'soldier's set.'

"The enthusiasm for radio during the quiet weeks at the outset of war would prove to any doubter that radio will be a big item in the troops' leisure hours during this war.

"The fortunate few who have a midget receiver or are stationed sufficiently near home to bring a set in are among the most popular of all ranks.

"The forces have restricted forms of occupying their leisure. The canteen provides one—but it costs money to go there, and few manage their money well that it solves the problem all time.

"The cinema has a tremendous a peal, but here again it cannot cater all the men all the time. Games, re ing, and the like are apt to pall af a time.

"Cannot the radio industry produce cheap receiver for a maximum of It would have to be light in weight a strong enough to withstand fairly rou usage, with the sensitivity sufficient the receiver to operate successfully a where in the British Isles or France

"At such a price a dozen men co club together and manage. The f that it seems to be the Governmer policy to house troops in permane huts with electricity 'on tap' in alm every case makes a mains set a pr tical proposition, and it provides means of lightening the set to the mi mum—a necessary point when the will periodically have to be tak along in a kit bag."

Components used in obtaining bias. The familiar bias battery is clearly seen. Included in the picture are typical bias resistors and a special electrolytic condenser used for "by-passing."

THE IMPORTANCE OF GRID BIAS

Here is an article written in simple language in which the importance of grid bias is discussed, as well as various methods of obtaining it. Even experienced set builders are often a little hazy on the exact reasons for the simple circuits they use. Later on we intend to continue this discussion, giving facts and figures concerning bias conditions for valves used in modern circuits.

☆

HE grid in the average valve is perhaps the most important element in its possible effect on performance. It is the input element of the lve, and the signals fed to it are those ich the valve is required to amplify. Consequently, quite a small change in d voltage will result in a large change the voltage developed in the plate cuit. This, of course, is brought about an increase or decrease in the plate rrent. So that changing the grid bias ll cause a corresponding change in ate current.

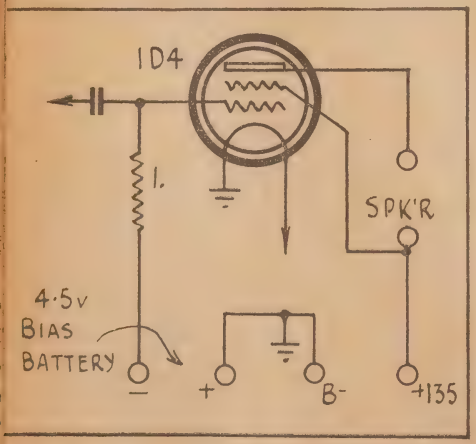
URPOSE OF BIAS

Very briefly, grid bias is applied to a lve so that its voltage operating point will allow the maximum voltage swing, positive and negative, to be applied to the grid. We are speaking now of the straightforward A class amplifier.

For instance, if we have a valve which operates with 4.5 volts bias, this means that the grid can probably be excited with twice that voltage with an exactly proportional increase or decrease of plate current.

If the grid is excited past those limits the flow of plate current will not be "linear," and distortion is introduced. The output signal will no longer be a faithful duplicate of the input.

According to the purpose to which the valve is placed, so are its grid bias requirements. A screen-grid type of valve, which has a very large amplification, can take only a small signal on the grid, and will need only a small bias. At the same time, the fact that small changes of grid voltage will cause large changes in plate current, means that care will have to be exercised to keep the bias as near as possible to the correct figure.



The conventional circuit showing the use of the bias battery. The exact voltage will depend on the type of valve used in the circuit. In all cases, the positive connection is made to the chassis and the negative connection to the grid resistance.

OUTPUT VALVES

In the case of a large power valve, the bias will be much larger, and the plate current change per volt of change in grid bias will not be so great.

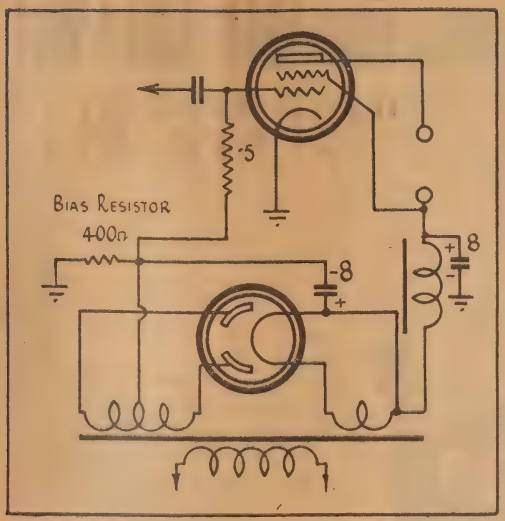
At the same time, such a valve will allow terrifically high plate currents to flow if the bias voltage should be reduced to zero—so much that the valve would probably be damaged very quickly under the strain. So that, although we can allow ourselves more latitude in the bias for such valves, we must be very careful to prevent it falling so low as to cause damage. A few seconds may be enough to cause disaster.

The valves which have higher amplification, such as screen-grid and the high-gain triodes, have a much higher plate resistance than the big fellows, and they are not so easily damaged if the bias is reduced to zero, as the plate current which will flow is not so large.

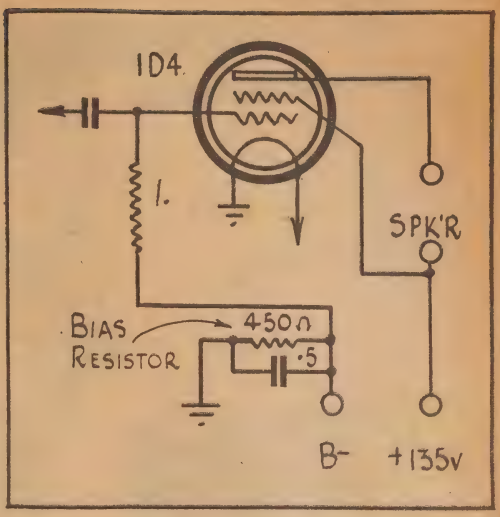
These remarks are not intended to be an exhaustive treatise on the subject, but they are intended as a quick reminder of the importance the grid voltage assumes in the scheme of things.

POSITIVE AND NEGATIVE BIAS

All this time, we have been dealing with the ordinary receiving valves. These require that the bias voltage shall be



This circuit shows the conventional method of obtaining "Back-Bias." The current of the set must flow through the resistor causing a voltage drop across it. The end to which is connected the grid resistor is negative with respect to the chassis.



A method of obtaining back-bias in a battery set. The resistor carries the full current of the set, which should be considered when calculating values. Note the similarity to the A.C. circuit

negative with respect to the filament or the cathode.

Naturally, if these conditions were reversed, a positive bias on the grid would aggravate still further the high plate current conditions which would occur, and valve damage would be still more certain.

Now we can get an effective grid voltage for the valve in two ways. Firstly, we can apply a definite negative voltage to the grid circuit, or we can make the filament or cathode of the valve positive by a voltage equal to the grid voltage required. In this latter case, the grid circuit would be returned to "ground."

A little thought will make clear that both these methods will have the same result. All we must remember is that the effective bias is always measured between filament or cathode and the grid.

DIRECT BIAS

The simplest form of direct bias is that which uses a small battery, the positive pole of which is connected to the filament, and the negative pole of which is connected to the grid circuit "return."

We must have some resistance or impedance in the grid circuit of the valve, otherwise the voltages applied to the grid would be short-circuited to earth. This resistance or impedance generally takes the form of a coil or a straight-out resistor. One end is connected to the grid, and the other to the source of bias. Our diagrams will make this clear.

Secondly, we could use a small power supply, in the case of an A.C. set, from which to obtain our negative bias. As a general rule, such a supply would be used only where the bias is large, as in the case of special amplifiers, or where special precautions must be taken to ensure that the bias voltage is quite steady, as in a high-powered B class amplifier.

There is another method of obtaining direct bias, and that is by using a special little cell, which, when inserted in the circuit, will give a small potential which may be used for bias. These cells are sometimes used in America, but rarely, if ever, are they seen in Australia. They are quite different from the ordinary "dry" cell.

BATTERY BIAS

Battery bias is mostly used in battery sets, and sometimes in special amplifiers. However, the tendency these days is to obtain the bias "automatically," as we will explain in a moment.

In the case of battery sets, automatic bias is handy, but the voltage must be subtracted from the total available high tension voltage, from which primarily it comes. Battery output valves work best when the maximum allowable voltage is used, and their output falls off quite appreciably as the B battery voltage is decreased. Therefore, a bias battery, being quite cheap, and having quite a long life, is often preferable, as it allows the full high tension to be employed, irrespective of what bias voltages are required.

In some cases, particularly where the output valve is a pentode, calling for not more than 4.5 volts bias, this isn't such a serious problem. However, with t 1C56, for instance, which needs only volts, and a bias of 9 volts, a seric reduction of power output may be e pected when using automatic bias.

CATHODE BIAS

The automatic bias most often used known as the "cathode bias" method. is very simple, and can be employ in the case of practically any A cl amplifier which uses a cathode t valve, or a valve using an individual fi ment winding.

This system, instead of applying negative bias to the grid, with the cat ode at earth potential, applies a posit voltage to the cathode, with the g return at earth potential. For this r son, either a cathode-type valve m be used, or one with a filament wind of its own, unless, of course, seve valves are concerned, all calling for t same bias value.

The essential component in the ca ode-bias circuit is a resistor connec between the cathode of the valve a ground (sometimes called earth, a actually the chassis).

As there is a current flowing throu this resistor (the total cathode curr of the valve), there will be a volt drop across it, according to Ohm's la

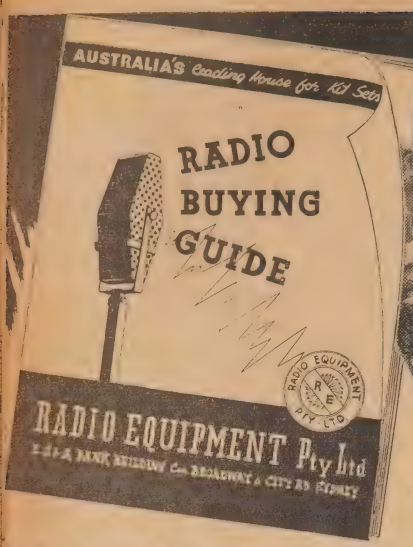
CALCULATING RESISTOR

For instance, if the cathode curr of the valve equals 10 mills, and t bias resistor measures 1000 ohms, drop across it will equal 10 volts. T means that the cathode will be 10 vo positive with respect to the chassis. you care to go over the theory of c rent flow, &c., you will soon see why cathode in such a case is always m positive than the chassis.

Now if we connect the grid return c cuit to the chassis, we have the grid

OUR POSTAL QUERY SERVICE

IN accordance with many requests from our readers, we have recommenced our shilling postal query service, which we were forced to suspend some time ago. See announcement in "Answers to Correspondents" on page 76 of this issue!



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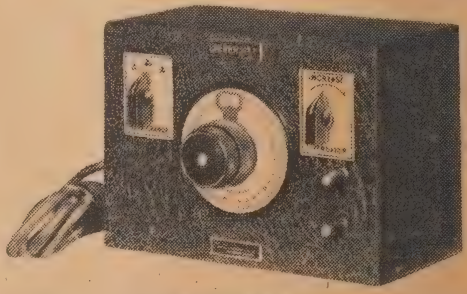

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zero potential. Thus, in effect, we have the grid more negative by 10 volts than the cathode, which gives us a bias equal to this amount.

By varying the value of the resistor, we can obtain any bias voltage required by the valve.

SUBTRACTED FROM HIGH TENSION

This bias voltage must, of course, be subtracted from the total effective plate current applied to the valve, as the valve and the resistor are, in effect, a voltage dividing system wired across the power supply. Thus we must make our measurements from plate to cathode to learn the effective plate voltage.

In the case of valves not requiring more than about 10 volts or so of bias, this subtraction from the supply is not serious.

However, in the case of the larger power valves, such as the 2A3, which needs either 40 or 60 volts, according to the circuit employed, it is quite an item, and must be taken into consideration when designing a receiver.

BY-PASSING THE RESISTOR

Any resistance or impedance placed in the cathode circuit of a valve must be adequately bypassed according to the nature of the valve's duties. In the case of an R.F. amplifier, a condenser which will present a low impedance to R.F. currents must be used. As a rule, a .1 mfds. tubular condenser is sufficient here.

In audio circuits, something larger than this is required, as a .1 condenser will not pass audio frequencies of a low order very efficiently. For this work, special electrolytic condensers are used, generally having a capacity of 25 mfds. and a working voltage of up to 40 volts. These are adequate in allowing free passage to very low frequencies as well as to the high frequencies.

As a matter of fact, this high capacity is not absolutely necessary, unless the resistor value is very low. In the case of a 2A3, for instance, where 750 ohms might be used as a bias resistor, a paper condenser of 2 mfds. would probably be ample for all practical purposes. A better plan, however, would be to use a lower capacity electrolytic having a higher operating voltage. One of 8 or 16 mfds. and working at 350 volts or higher, would be a better compromise between price and efficiency.

BACK BIASING

Another method of biasing which is often used is known as "back-biasing." This is a form of direct bias, in that the grid return of the valve is connected to a point negative with respect to the chassis or ground.

This negative point is obtained by wiring a resistor in series with the centre-tap of negative lead of a power supply, so that the drop across it is equal to the required bias.

Through this resistor will be flowing the full current of the receiver, and this is the current to be taken into account when working out the right resistance by Ohm's Law.

Naturally, the most negative end of the resistor will be that connected to the power supply. So we connect the grid return of the valve concerned to this point, and the filament or cathode to the chassis.

As the resistor is not in the audio circuit of the valve concerned, there is no need to bypass this resistor for audio frequencies, as would be required were it in the cathode or filament circuit. The filter condenser immediately after the rectifier is sufficient to provide the return path for audio frequencies.

Incidentally, it is important for this condenser to be wired as shown in our diagram, otherwise the A.C. ripple, remaining unfiltered, would set up hum voltages across the bias resistor. It is sometimes a good idea to bypass this resistor with a low voltage electrolytic just in case, if low hum levels are required in the receiver. Particularly is this so if the field coil has a low resistance or inductance.

CONSTANT VOLTAGE

One advantage of this method is that, where variations in the plate current of a large amplifier, such as the 2A3, might cause corresponding variations in an opposite direction across the bias resis when using a cathode resistor, with back-bias scheme the full current of receiver flows through the resistor, the extra current tends to maintain voltage drop more constant.

In special cases, even this metho not good enough to maintain a ste enough bias, and a separate bias so of voltage is then necessary for best sults. An example of this is foun valves such as the 6L6, which will their full 60 watts output only w special precautions are taken to main both bias and screen voltages at a fectly constant level.

CONTACT POTENTIAL BIAS

Another method of obtaining bias yet mentioned may be used in spe cases. Where we have a high-gain tr such as the 6F5, or the triode section 75, for instance, the insertion of a high resistance in the order of 10 m ohms, will provide sufficient bias. is due to an effect known as "con potential," which is responsible fo very small current flowing in the circuit of the valve. The voltage it will cause when flowing through very high resistance is enough to the valve, which requires only a s voltage.

Unfortunately, this very high re ance value makes the circuit pron pick up induced hum, and for that re it is rarely used, except as a quick out when cost is an item to be sidered.

VARIABLE-MU VALVES

THERE is still another form of we have not considered. This is bias generated by the A.V.C. systen a receiver.

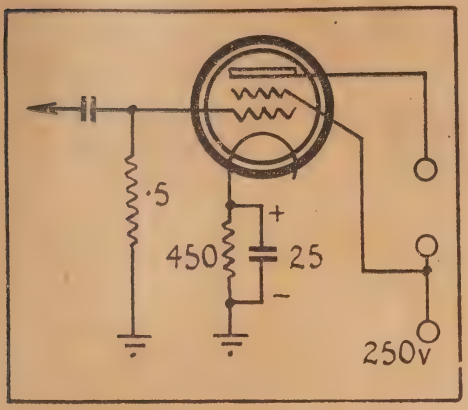
In order to control volume, mo sets use "variable-mu" R.F. amplif These have a special, grid forma which allows sensitivity to be va over a wide range with a variatio control-grid bias.

This method of control may be ap either manually, by returning the coils to a variable source of bias, o applying A.V.C.

This latter method makes use of signal appearing in the detector ci to apply bias to the R.F. amplifiers. signal is fed to a rectifier system, w sometimes is actually the detector d circuit, and the D.C. voltage which sults from this rectifying action is back to the grids of the R.F. valv

Thus, a strong signal applying a l negative bias will cut the sensit down a good deal, while a weak si will allow the set to remain much sensitive. Thus, an approximately output can be expected from stat whose signal strength varies over a range.

This, however, is a subject enough for a special article all itself.



★

The conventional circuit for automatic biasing on indirectly-heated valve. The current of the valve sets up a voltage drop across the resistor which makes the cathode positive with respect to the chassis.

★

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eing a very elementary course of Radio study for those who wish to know "what makes the wheels go round."

L. B. GRAHAM, Principal of the Australian Radio College, Pty.,

A SIMPLE EXPLANATION OF DETECTION

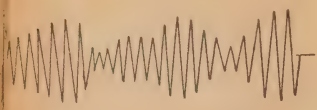
The detector is a very important part of any radio receiver. Not only the tone quality, but to a lesser extent the sensitivity and selectivity are "made or marred" by the detector circuit incorporated in a receiver.

T is not the purpose of this article to deal with the individual action of various types of detectors, but to explain what detection is and how is accomplished.

The object of any detector is to parate the audio frequency modulations, presenting speech or music, from the odulated carrier wave, the modulation

g. 1.—An audio wave-former representing a signal.

FIG. 2.—The Sound Frequency.



Impressed on the carrier wave of the transmitter.

ing amplified by the remainder of e circuit and reproduced as sound in e loud speaker.

The detector in the receiver performs e reverse action to the "modulator" a transmitter. The modulator comnes the audio and radio frequencies form a modulated carrier wave as own in Fig. 1.

ETECTOR'S JOB

The slow rise and fall of the peaks the carrier represents the audio equency. The detector must produce output voltage which faithfully reesents this peak variation.

The modulated carrier wave is of high equency which cannot be heard by the man ear. The first function of any tector is to rectify this high frency to obtain a pulsating direct current, the pulsations of which are still occurring at high frequency.

To give rectification, the rectifying device, whether it be a crystal, valve, or even a mechanical system, must offer a different impedance to currents trying to move in opposite directions, so that those trying to move in one direction are eliminated, or at least made much weaker, than those moving in the other direction.

GRID CONTROLS CURRENT

The grid of a valve is the controlling element. By varying the voltage applied to it, we can vary the plate current of the valve. The curve of Fig. 2 represents the effect of grid voltage on the plate current.

It can be seen from this curve that, as the bias is made more negative, the plate current decreases in proportion until minus 7 volts is reached. The change in plate current between 7 and 8 volts being much less than between 6 and 7 volts, the current change between 8 and 9 volts is less still. At 11 volts the current ceases altogether. The general shape of this curve, with alterations, would apply to crystal, diode, bias and grid leak detectors. The valves of voltage and current, of course, only apply to bias types.

WORK OF GRID BIAS

The position at which the signal operates on this curve is determined by the grid bias. As an amplifier a bias of about 3.5 volts negative would be used. The signal would then be applied to the centre of the straight part of the curve. As a detector, however, a bias of about 8 volts negative would be necessary, the signal working down on the lower bend.

With a signal of 5 volts applied to the tube having an 8 volt negative bias, the grid voltage will become minus 3 volts with the positive half cycle of signal, and minus 13 volts with the negative half cycle. The positive half cycle produces a current change of from 2 to 11, or 9 mills. The negative half cycle produces a change of from 2 to zero, or 2 mills.

The signal has been rectified by the simple action of giving the grid a strong negative bias.

DIODE RECTIFIER

A rectifying action is easily obtained in a diode, because it is only when the plate is positive that current will flow. The negative half of each cycle can be considered as cut off completely.

The grid leak type of rectifier has two distinct and separate actions which occur at the one time. Rectification is carried out in the grid circuit, and at the same time the tube acts as an amplifier.

The action of rectification does not, by any means, complete the action of

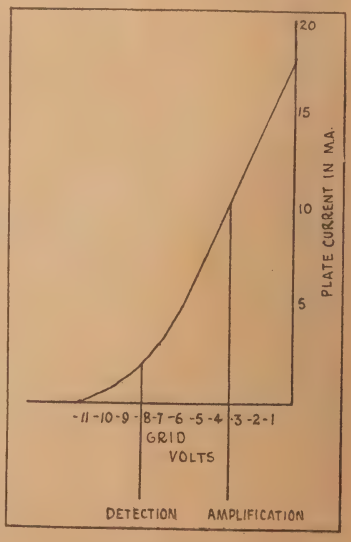


Fig. 2.—Typical grid-bias plate-current curve of a valve. Operating points for detection and amplification are shown.

a detector. The plate current of a detector, whilst only flowing in one direction, is still pulsating at radio frequency, and it is necessary to "average" this radio frequency before the audio frequency can be obtained.

The "averaging" is carried out by means of a "bypass" condenser. In any normal circuit there is sufficient capacity in the tube and wires, &c., to do the job, but the performance is much more effective when additional capacity is used.

CONDENSER ACTION

The operation of this condenser has been explained in an early article. Just briefly, the condenser charges with the first impulse of radio frequency, and as this impulse dies off, the condenser tends to discharge. To discharge it must send current through either the tube or the plate load, both of these paths are of high impedance, so that the rate of discharge is slow. The next pulse then recharges the condenser before it can fully discharge. This action gives an average current which is a faithful reproduction of the shape of the envelope of the modulated carrier wave.

This direct current, pulsating at audio frequencies, flowing through the plate load produces changing voltages which represent those added to the carrier at the transmitting station.

Having completed the study of the components used in a radio receiver, it is necessary to see just how these are applied in normal practice.

Although superseded by the superheterodyne type of receiver, the "Tuned Radio Frequency" type is much more simple and will serve as an illustration of the use of the various components.

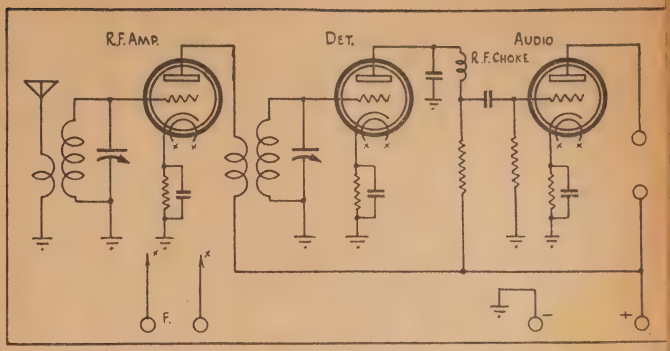
SIMPLE CIRCUIT

Fig. 3 is a circuit of a very simple tuned radio frequency receiver. The three stages, radio frequency amplifier, detector and power stage, form the basis on which all sets of this nature are constructed.

In operation, voltages are induced into the aerial by the modulated carrier wave. These voltages cause a changing current flow in the primary winding of the aerial coil. The current, alternating through the turns of this primary, produces rising and falling lines of force, which, on cutting the turns of the secondary, generate a voltage in it which varies in accordance with the modulated carrier wave.

The oscillatory circuit formed by the secondary of the aerial coil, and the variable condensers connected to it, is then made to resonate at the station's frequency by changing the capacity of the condenser until its negative reactance is equal to the positive reactance of the coil. These reactances will cancel, allowing a current to oscillate in the circuit and resulting in the development of comparatively large voltage changes across the circuit.

These voltages are applied to the first tube as varying voltage differences between grid and cathode, and will cause the plate current of the tube to vary accordingly.



A very much simplified circuit of a three-valve set to illustrate various points brought out in the article.

The varying plate current of the first tube is drawn from the B supply through the primary of the second radio frequency transformer. The passage of varying current through this coil again causes rising and falling lines of force which generate a voltage in the secondary, the same as in the first coil, only this time the voltages are much stronger because the first tube has amplified the signal.

The second coil and condenser are tuned in a similar maner to the same frequency as the first oscillatory circuit, and a voltage is applied between the grid and cathode of the detector tube. The detector rectifies, and the bypass condenser averages the signal, as explained previously.

The plate current of the detector tube, pulsating at audio frequencies, is drawn from the B supply through the plate load resistance. This causes the voltage drop across the load to vary in accordance with the audio frequency. The R.F. choke in the detector plate circuit is used to prevent the radio frequency component from getting into the remaining circuits.

The condenser between the detector tube's plate and the power tube's grid, while allowing the passage of the audio frequencies, prevents the high voltage of the detector tube's plate from affecting the power tube's grid circuit.

The audio voltages developed across the plate load are transferred to the input circuit of the power tube. The grid circuit of this tube is completed by the resistor between grid and earth.

Voltage applied to the grid of the power tube causes a varying current to flow through speaker or phones. This varying current causes the diaphragm of the reproducing unit to vibrate. The air disturbances set up are interpreted by the ear as sound.

There are many variations of the "Tuned Radio Frequency" receiver. There may be any number of radio and audio frequency stages, but the operation of any one stage is identical with its equivalent explained in the foregoing paragraphs.

The "Superheterodyne" receiver has almost completely superseded the T.R.F. type at the present time, and its action will be explained in the next article.

THOSE OCTAL SOCKET CONNECTIONS

Some Terminals Are Not Used

OF late we have received many letters from readers, obviously beginners, who have been worried over the connections to their octal sockets.

The trouble has arisen when the set is in the course of construction, and the perspiring builder finds he has several terminals on his sockets with no wires running to them.

Pandemonium breaks loose! What's gone wrong? A hurried reference to the wiring diagrams shows that these blank lugs MUST have been overlooked by our artists!

Now, octal sockets have become standard because it was thought a good idea to use only one type of base and socket, instead of half a dozen. Thus, every valve of this type will have a socket with eight pins, although the valve itself may not need them all.

For instance, a battery triode valve will use only four—two for the filament, one for the grid, and one for the plate. Obviously, it isn't the slightest use trying to find connections for socket lugs that don't connect anywhere!

There are, in fact, few valves which use all the pins. The metal 6A8 is one. It has two filaments, cathode, plate, screen, oscillator plate, and grid, and a control grid connection to the cap. The ninth connection is to the metal shell.

Most of the connections to the various elements are in the same positions on all valves. However, when next time you see vacant lugs on the socket, take it easy. The diagram is probably right after all!

THE SERVICE-MAN WHO TELLS

By A Service Engineer Of
Radio Equipment Pty., Ltd.

Radio receivers are, on the whole, rugged affairs these days. Once upon a time we thought twice about handling valves with anything but cotton wool. Now we can transport our receivers about the place with scarcely a worry as to how they will survive the ordeal. But there is one destructive agent we must watch. Weather conditions, and particularly high humidity, can cause deterioration even if the set is not in use.

EW PEOPLE realise how much effect changing weather conditions have on the operation of radio receivers. In many cases the effects are not ry noticeable, but in some instances y are sufficiently marked to require attention of the service engineer.

The hot dusty days we have been periencing lately, together with the at which is always released under chassis of a modern radio receiver, ve brought about, or have at least rried on, quite a number of breakwns in various radio components, ncipally condensers, or have wrought h changes that certain readjustments e necessary.

UMBER 1.

A person who brought in his radio ceiver for repair the other day comained that it produced a tinny, rattling und every time his favorite soprano ng a high-pitched note or when a sical instrument played certain notes.

On looking into the back of the reiver I noticed that most of the comnents and also the loud speaker were ated with a thick layer of dust.

On switching on the receiver there is quite a definite rattle on certain equencies and at first I thought that is was simply caused by the bakelite dial escutcheon vibrating against the cabinet. Holding the escutcheon tightly against the cabinet certainly improved the reception quite considerably, and after packing a small piece of paper between this and the cabinet, reception was considerably improved. A slight amount of rattle still existed, however, and I decided to make a closer inspection of the loud speaker.

On removing the loud speaker from the cabinet, and carefully moving the cone in and out slightly, I felt that the cone was rubbing against something and not moving freely. I blew as much dust as I possibly could out of the centre of the cone by blowing into it very strongly, but this did not "free up" the voice coil. The next step was to loosen the screw which holds the centre support of the cone and insert three small strips of brass or paper in order to space the voice coil centrally in the air gap between the centre pole piece and the front plate of the speaker. I always use three strips of brass about five-thousandths of an inch in thickness and three-sixteenths of an inch in width. These can easily be cut from a small sheet of five-mill shim metal, such as that used for packing the bearings of automobile engines.

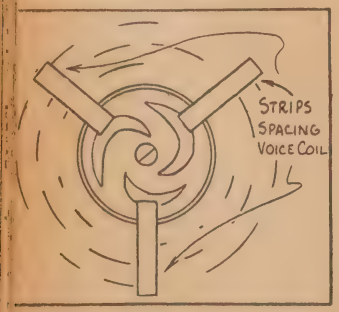


Diagram showing how the spacing pieces should be placed to realign the voice coil in the gap.

SPACING PIECES

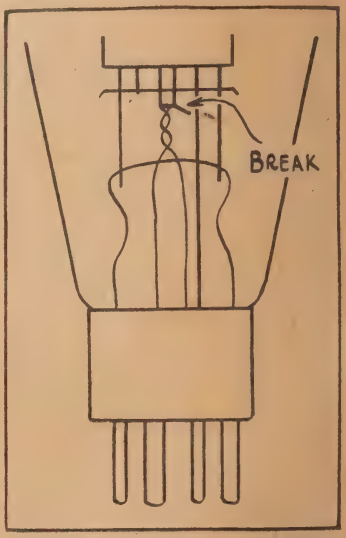
The three strips of metal or paper (a thin visiting card will do quite well) are inserted in the narrow gap between the inside of the moving coil and the centre core of the speaker through the slits which are usually provided in the centre support. After these strips are inserted in the gap, the moving coil should be spaced centrally from the centre core and the centre screw tightened. The strips are then removed and the cone carefully moved in and out to make sure that it moves freely.

After recentring the cone in this manner, it moved quite freely in and out without any sign of rubbing at all and on replacing it in the cabinet, the set worked quite satisfactorily. The trouble in this case was that the hot weather, in conjunction with the heat of the receiver, had apparently warped the voice coil or centre support slightly out of shape.

NUMBER 2.

A second receiver which came into our laboratory recently was quite dead when first switched on. The first thing to do, naturally, was to check the tubes and to make sure that these were all in good working order. On removing the tubes and trying them in a tube tester the power output tube proved to be quite defective.

The fact that this tube was the cause of the trouble was born out by the fact that as it was removed from the set with the power switched on, there was no click from the loud speaker. Normally, when a valve is removed from its socket with the set in working order, a distinct click should be heard from the loud speaker.



An internal break between the cathode and the connecting lead running down the stem.

On replacing this particular valve with a new one, the set was quite normal again.

It is always interesting to find out just why valves cease to operate satisfactorily, and on making a close visual examination of this valve I noticed that the wire which normally connects the cathode to the wire passing down through the glass press to the base had become separated. These two wires are normally welded together, but the ends had come apart and were separated by a small distance. In this way no plate or screen current was able to pass from the plate or

screen grid to the cathode and then down through base prongs to B minus in the receiver.

NUMBER 3.

The very fine wire used in winding intermediate frequency transformers, radio transformers, and speaker transformers frequently becomes corroded through after a period of time. The corrosion is either due to moisture, impurities in the insulation materials on which the wire is wound or an electrolytic decomposition.

In one receiver recently an annoying crackle was present whenever a station was tuned in. To make sure whether this noise was being caused in the receiver itself or whether it was being brought in by the aerial and earth system, I disconnected the aerial and earth, and, instead, connected the signals from an oscillator to the aerial and earth terminals. The noise still persisted, proving it to be in the receiver.

To obtain an indication as to whether the noise was being produced in some of the circuits before the first detector valve or whether it was being introduced after the first detector, I removed the grid cap from the first detector and connected the output of the oscillator to this point. I also short-circuited the plates of the condenser gang section which tune the oscillator coil. The test oscillator was tuned to produce a signal of the same frequency as the intermediate frequency of the receiver. This signal going into the grid cap of the first detector tube was passed on through the intermediate amplifying stages and the signal from the oscillator was heard from the loud speaker. The crackle was still present, proving the fault to lie in some of the parts still in use, that is, in the I.F. amplifier or audio frequency stages of the set.

As there was no audio frequency transformer in this receiver and a new loud speaker operated in just the same manner as the one fitted in the set, I naturally concluded that the fault must lie in one of the I.F. transformers.

TOUGH METHODS.

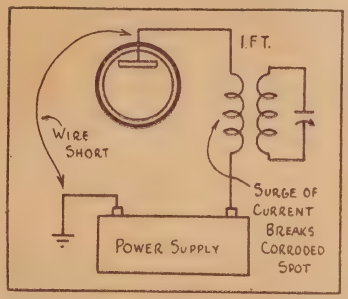
The next step was to find out which transformer of the two was defective without going to the trouble of replacing both with new ones. To do this I touched a short piece of wire from the plate of the first detector tube to the metal chassis and held it in place for about two seconds. After removing this piece of wire the receiver still behaved in the same way. I then used this same piece of wire to connect the plate of the I.F. tube to the chassis for about two seconds, and this time, after removing it, not only was the crackling absent, but also the receiver failed to operate. This proved that a weakness definitely existed in the second I.F. transformer, and that the severe strain placed on this by the short circuit, brought about by the wire, caused it to completely break down.

This may seem a rather tough and severe way of checking the I.F. transformers, but the point should be borne in mind that if the transformers are good the short circuit, which only remains for about a second or two, will not do them any harm at all. If the transformers are just on the verge of breaking down, the short circuit will usually cause them to become completely defective, so that the weakness can be easily detected. This type of fault usually does not show up at all on an ohm-meter or continuity tester.

This test is also very useful for checking the windings of audio frequency transformers, loud-speaker transformers or R.F. chokes. If the component in question is completely broken down by the short circuit, then it is quite certain that it was just on the verge of breaking down or at least extremely weak before the short circuit was applied.

NUMBER 4.

Another person brought in a receiver a few days ago and said that he was extremely pleased with the tone quality of the set, and, in fact, had never heard a modern receiver which gave as good results. For this reason he did not wish to purchase a new receiver, but yet wished to have his set brought a little more up to date by fitting a modern type of dial. He asked me to simply fit a new type of dial marked with the station call signs, so that the tuning would be simplified without making any other alterations to the set as he was afraid that something might cause the tone quality to be upset.



Arrow indicates corroded spot in primary which makes intermittent contact and finally fails.

PROBLEMS OF TRACKING

He was at first very disappointed when I explained to him that the type of tuning condenser used with his receiver was rather obsolete, and that modern tuning dials would not track accurately with this type of condenser. While it might be possible to make the call signs of the stations at the low and high frequency end of the broadcast band coincide with the markings on the dial, it would be almost impossible to get the other stations towards the middle of the band to come anywhere near the point where they were set out on the tuning dial scale. The only method of making the dial track accurately was to replace the tuning condenser, also, so that the dial could be used with the type of tuning denser for which it was designed.

The tuning coils used in a radio ceiver are always carefully designe cover the broadcast band in conj tion with a certain sized tuning denser. The condenser which was on the receiver was a type which a capacity considerably greater that of modern condensers, and co quently it would be necessary als replace the tuning coil in order to tain a completely satisfactory After talking these things over with owner of the set and explaining whole position to him, he soon rea that it would be advisable to have alterations carried out.

After replacing the dial, tuning denser and coils, the set not only the added convenience of a calibr dial which accurately indicated all various stations, but the sensit and selectivity were also somewhat proved. This was brought about by fact that modern coils and tuning densers are far more efficient than the older types used on sets or five years ago. The tone quality course, was not affected, and the tomer went away a very pleased happy man.

WORLD'S TINIEST MOTOR?

BUILT THE SIZE OF A PIN'S H

MERL BASSETT, a Washington trician, has completed the wo smallest working electric motor expending 191 hours on the task.

It cost him 1 cent, weighs .01195 grain, makes 3500 revolutions per mi and develops 54 ten-billionths of a ho power. It is about the size of a head, and he uses a single camel's ha start it.

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★ *Set-builder*

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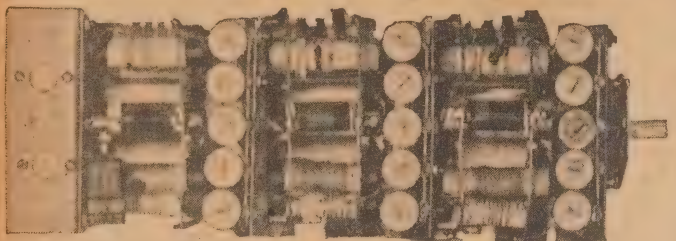
R.C.S. announce their latest release

THE 5-BAND COIL UNIT



TYPE DW30 FIVE-BAND UNIT

This unit operates from 9.8 to 550 metres, and is designed especially for communications receivers, and S/W sets generally. The "All-Wave" 6/40 described in this issue requires this unit and associate components—Kit Type K125 as listed.

	Type No.	Price.
1 5-band coil unit	DW30	£10 10 0
1 5-band special R.C.S. Dial	DA2	£1 2 6
1 Permeability Tuned I.F.	IF130 .	£0 13 9
1 Permeability Tuned I.F.	IF132	£0 13 9
Complete Kit as above	K125	£13 0 0

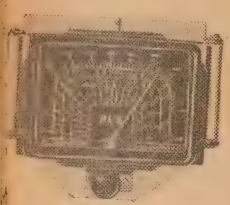
Specify R.C.S. Wirewound Voltage Dividers and Resistors.

For the Vibrator Power Amplifier Use the R.C.S. 6-volt Vibrator Pack, Type C788, with an output of 220 volts at 60 m.a.—the ideal for this job. Other voltages available.

Type C788. Retail Price £6 19 0
Specify R.C.S. Wirewound Resistors.

NEW R.C.S. DIALS

For some time we have felt that we should provide dials for use with coils of our manufacture, thus assuring perfect tracking. The dials illustrated are the result of considerable thought and enginering experimentation in our laboratory. Both types are single glass Dual Wave dials, the type DA2 having been designed especially for use with our Five Band Communications Receiver coil kit, and the "H" type condenser. Type DA1 is a standard Dual Wave dial for use with R.C.S. Coils and the "F" type condenser.



DA1. Standard D/W Dial, Retail Price, 22/6

As illustrated.

DA2. Communications Dial — Retail Price .. 22/6

R.C.S. TROLITUL INTERMEDATE TRANSFORMERS

Type 1F107

The new R.C.S. Trolitul I.F.s are extremely stable, due to new methods of construction made possible by the use of Trolitul formers and base. No loose wires to shift and alter frequency. Positively the best I.F.s yet produced.

Cat. No.		Retail Price
	Air Core, 465kc.	
IF107.	1st I.F. ..	7/6
IF108.	2nd I.F. ..	7/6
	Iron Core, 465kc.	
IF109.	1st I.F. ..	11/-
IF110.	2nd I.F. ..	11/-
	Air Core, 175kc.	
IE68.	1st I.F.	7/6
IE69.	2nd I.F.	7/6

R.C.S. TROLITUL MIDGET CONDENSERS

M.C. Type

R.C.S. Midget Condensers, are made in two types, using Trolitul supports, thus guaranteeing practically no loss.

STAR AND M.C. MIDGETS

Max. Cap. mmfd.	Min. Cap. mmfd.	Plates	STAR Cat. No.	Retail Price	M.C. Cat. No.	Retail Price
10	3	2	CV34	3/6	CV41	6/9
15	3	3	CV35	3/9	CV42	7/3
25	3.5	4	CV36	4/-	CV43	7/10
35	4	5	CV37	4/3	CV44	8/6
50	4	7	CV38	4/9	CV45	9/-
70	5	9	CV39	5/4	CV46	9/6
100	6	14	CV40	5/11	CV47	10/3

The new R.C.S. Permeability tuned Intermediates are wound on special Trolitul formers into which are inserted the adjustable iron cores. These R.C.S. Permeability tuned I.F.'s are the most dependable and efficient intermediates it is possible to produce. They should be used whenever the optimum in results is required.

PERM. TUNED 465 K.C.

Standard when 2 I.F.'s are used.

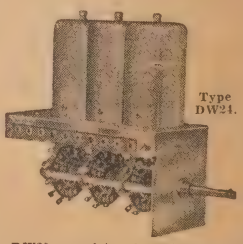
Type		Price
IF130.	1st I.F.	13/9
IF132.	2nd I.F.	13/9
	When 3 I.F.'s are used.	
IF131.	1st I.F.	13/9
IF131.	2nd I.F.	13/9
IF132.	3rd I.F.	13/9
	For Push-Button Kits.	
IF113.	1st I.F.	13/9
IF114.	2nd I.F.	13/9

Type IF113.

R.C.S. DUAL WAVE UNITS

Type DW, as illustrated, consists of Aerial, R.F. and Oscillator Coils, Wave Change Switch, the necessary B/C and S/W Trimmers and Padder mounted on a rigid steel base, wired up ready to assemble in a set utilising 465kc. and an R.F. Stage. The bands are S/W 16 to 50 metres, and B/C 1500 to 550kc.

	Retail Price
DW24 for A.C. operation ..	£3 7 6
DW25 for Battery operation ..	£3 7 6



Type DW24.

Type DW29, consists of Aerial and Oscillator Coils, Wave Change Switch, the necessary B/C and S/W Trimmers and Padder mounted together, wired up ready to assemble into a set utilising 465kc., the bands being S/W 16 to 50 metres, and B/C 1500 to 550kc.

R.C.S. Type DW29 Dual Wave Unit. Retail Price £1 7 6

R.C.S. TROLITUL BROADCAST COILS

These coils are available in both Air Core and Permeability tuned types. The latter are adjusted to ensure maximum efficiency in our laboratories.

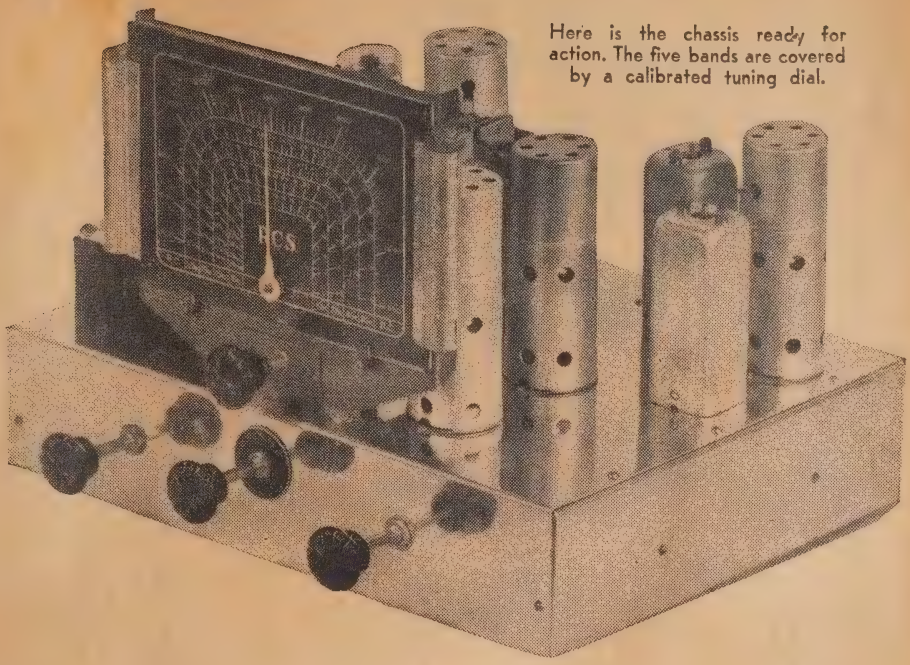
Cat. No.		Retail Price
	Air Core.	
E232.	Aerial . ..	6/6
E233.	R.F.	6/6
E234.	Osc.	6/6
	Permeability.	
E279.	Aerial . ..	8/6
E280.	R.F.	8/6
E281.	Osc.	8/6

Type E284.

Obtainable from your local dealer, or write direct to

R.C.S. RADIO Pty. Ltd. 50 Glebe St., Glebe, Sydney. Phone MW2405.

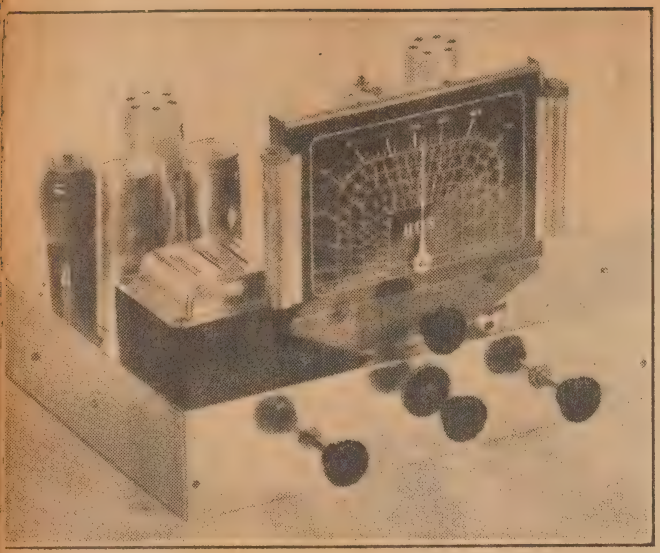
AN ENTIRELY NEW A.C. RECEIVER



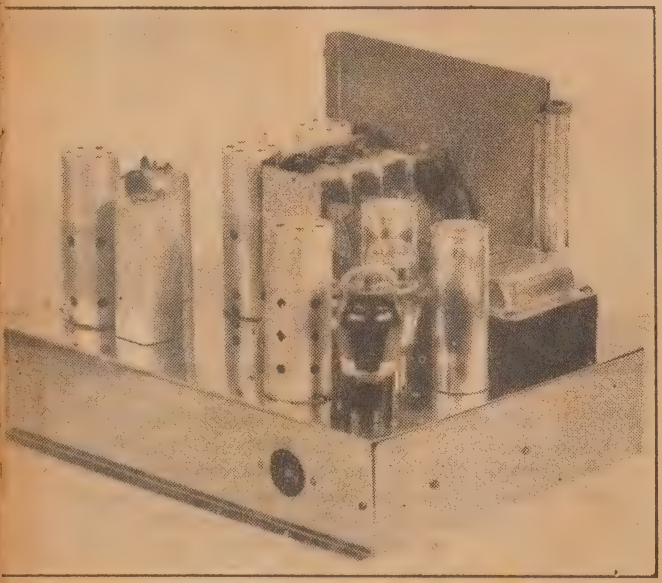
Here is the chassis ready for action. The five bands are covered by a calibrated tuning dial.

THE ALL-WAVE 6/40

For the first time in an Australian magazine, we present a really satisfactory All-Wave set. It has been made possible by the development of a new type of switch-coil assembly. Apart from a first-class performance on the broadcast band, it will give excellent reception over the short-wave bands as low as 10 metres. A specially calibrated tuning dial is available for the coil kit. This is NEWS in set construction, because it is impossible at present to buy a set in Australia with the same features as the All-Wave 6/40.



A general view of the chassis. Note the special calibrated dial specially made to go with the coil unit. The wave-change switch has a little escutcheon plate which indicates what band is being employed. Volume and tone controls make up the four knobs.



The chassis from the rear. Note that the R.F. and audio sections are grouped at opposite ends of the chassis. Connections between coil box sections and the tuning gang are made by running the leads straight through the chassis. These leads therefore are only an inch or two in length.

FROM time to time, readers have written to us, asking for a description of an all-wave receiver. An all-waver, we might mention is a set which has more than the ordinary two tuning-bands—broadcast and "short-waves." It is one which covers as nearly as possible all the wavelengths on which signals are likely to be heard.

The ordinary receiver is limited to two bands by several considerations.

In the first place, the cost of making a set with more than two bands is likely to be considerably higher than one which only uses two. This is one objection.

But it might not be so important, if the results made the price worth while. For the average man, however, it is doubtful whether the increased cost would be justified.

MAIN SHORT WAVE BANDS

In connection with short wave reception, let us for the moment consider what there is to hear.

The short wave bands these days have grouped themselves at 13, 16, 19, 25, 31 and 49 metres.

There are to be found odd stations operating between these bands, of course, but the main overseas and Australian short wave transmissions will be found round about those wavelengths.

Concerning the programmes from any one country, there are nearly always radiated on more than one wavelength. Often there are two transmitters narrowly separated in the same short wave band.

It is obvious, therefore, that we do not need to be able to receive all these short wave bands to get practically anything in the way of news and entertainment which may be offering. If we are able to tune in most of them, that should be sufficient.

And in most cases, it is sufficient. A receiver which can tune down, shall we say, to 16 metres, and up to 31 metres, is not likely to lose anything worth while hearing.

S.W. TUNING RANGE

This is the reason manufacturers of sets have not bothered, except in a few isolated cases, to make sets with more than one short wave band.

The "width" of the tuning range on the short waves is limited largely by the value of the set's tuning condenser. The same condenser is used for short waves as for the broadcast band, and its variable capacity will determine over what range the set will tune.

Speaking broadly, if we have a set which can get down to 13 metres, we must be satisfied with at the most 31 metres at the top end. If the set only goes down to 16 metres, there may be enough capacity for the set to go to

THE 6/40 ALL-WAVE A.C. RECEIVER

At last there has been placed on the Australian market, an All-Wave tuning unit, which will answer the prayers of numerous readers. The unit covers from 10 metres to the broadcast band, and comes ready lined and padded for assembly to the chassis. This is a set for the luxury lover, who will find it a grand performer. The unit has been developed by R.C.S. in close collaboration with "Radio and Hobbies."

about 50 metres. In either case, there is a considerable amount of the short wave world, above and below the tuning range of one coil, which the set owner cannot explore.

This is why we have been asked for an all-waver—one which would tune in the broadcast band, and at the same time cover all the short wave bands worth having—preferably from 10 to 100 metres.

There is, of course, very little difficulty in designing such a receiver. In fact, the circuit &c. need not be any different from that used in the normal way for a dual-waver.

The only snag to date has been the lack of a suitable tuning coil assembly. All we had available was the standard dual-wave unit.

NEW COIL ASSEMBLY

It must be over 12 months now since we first discussed the possibility of such a unit with the R.C.S. people. We pointed out the steady demand for such a unit, and suggested that one might be produced.

The only snag in the whole idea was the probable price of the coil assembly. Naturally, there would be a good deal of work involved in designing and producing it. Again, we could not expect a very large volume of sales, not only because the unit would be expensive, but because its appeal might be limited to those short wave fans who wanted everything on the air.

However, all kinds of ideas were thought of and discussed, until finally, the coil assembly was actually on the way.

MONTH OF LABOR

It is quite correct to say that months of work have gone into its production, and it must have already cost the factory a considerable sum of money. For it was realised that, not only would the assembly be rather an elaborate affair, but also it must be capable of "staying put" when finished, because obviously a special dial would be needed for it, calibrated for each tuning band.

Furthermore, the special nature of the job means that its assembly must be in the hands of special operatives, with more than the average knowledge of their business.

THE FINAL DESIGN

At last the first sample was finished, and we were able to inspect it in a sample short wave set built up in the R.C.S. laboratory. This set was intended as a test sample, in which various points of matching &c. could be carried out.

Notwithstanding the extreme suitability of the assembly for a short wave set of this type, we decided first of all, to use it in a straightforward receiver of the type we had been asked for.

The main reason for doing this was that good short wave receivers take a little time to build, require very careful checking and, furthermore, may not have the same appeal as would a simpler receiver. We intended at a later date to use the coil assembly in a rather elaborate set, specially designed for the short wave fan.

The unit itself, as you will see from the photographs, is built radially round the coil-changing switch. There are five bands in all, and the three sections co tain coils for the R.F. stage, conver grid circuit, and high-frequency osc lator circuit. They correspond with t three sections found in the ordina dual wave assembly.

PARTS LIST

THE ALL-WAVE 6/40

1 base, 14 x 10½ x 3.
1 special all wave coil assembly-tuning unit and 2 intermediates.
1 tuning dial to suit.
1 3-gang tuning condenser.
1 1.5 meg. resistor.
2 1 meg. resistors.
2 .5 meg. resistors.
1 .25 meg. resistor.
2 .01 meg. resistors.
2 50,000 ohm resistors.
1 2500 ohm resistor.
3 300 ohm resistors.
1 25,000 ohm V. Divider.
1 .5 potentiometer.
1 .05 potentiometer.
1 200 ohm resistor.
1 .0001 mica condenser.
1 .00005 mica condenser.
5 .05 tubular condensers.
5 .1 tubular condensers.
1 .00025 mica condenser.
3 .5 mfds. tubular condensers.
2 25 mfds. Electrolytics.
3 8 mfds. Electrolytics.
1 power transformer, 385 v. at 80 m.a., 6.3 v. at 3 amps., 5 v. at 2 amps.
Valves—6U7G, 6K8G, 6G8G, 6J7G, 6V6G, 80.
Speaker, 2000 ohms field matched to 5000 ohms.

AIR-TRIMMERS

There are several points in constru tion, however, which are different. Ea coil is wound on its own trolitul form and no two coils are wound on the sa former.

In order to maintain as accurate ca bration as possible, each coil is lined with its own air-trimmer, instead of t mica type more often used.

These trimmers have been used b cause of their very much better co stancy. They are almost completely fr from any drift, due to temperature humidity changes, and their efficien also is better. They are much more e pensive than the mica types, and themselves, represent a considera proportion of the cost of the unit.

MOUNTING AND CONNECTION

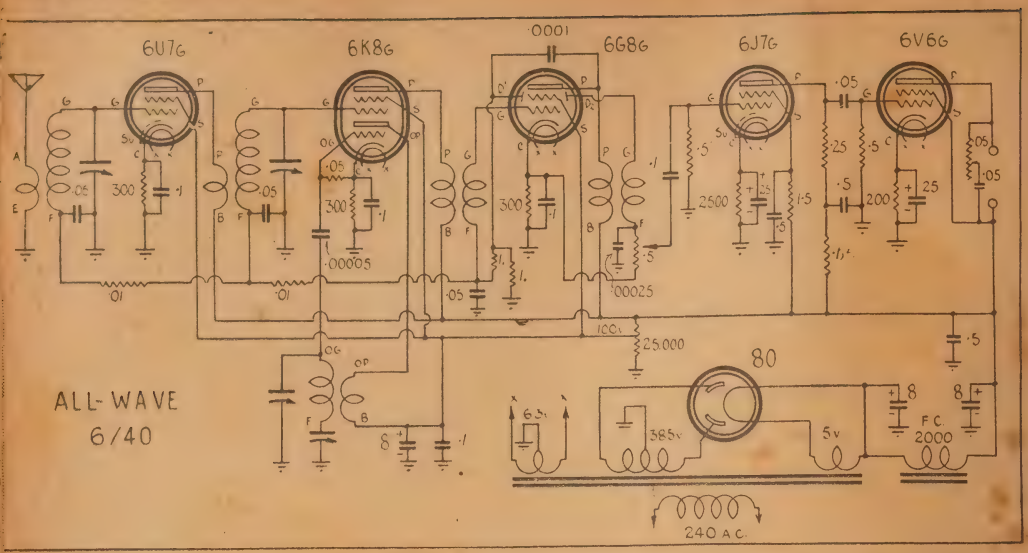
The unit is mounted underneath t chassis. In order to make the whole rigid as possible, remembering its ext size, it may be bolted to the chassis two places at the top of each of the thr partitions. In addition, there is a on hole mounting for the switch at t front of the unit. When in place, should be quite free from any weavi or distortion which might be set up wh the switch is operated.

The connections to the unit are ve similar to those of a straightforwa dual-wave unit. All the connections a color-coded, so that there is no dif culty at all due to the more elabora design.

It fits into the chassis immediate beneath the tuning gang, and the co denser leads run through the chas straight to the solder lugs on each se tion of the gang.

THE TUNING DIAL

Five bands without a calibrated tu ing dial, would be something of a co structor's nightmare! A special di was indicated as being a necessary co panion to the unit. So R.C.S. have ma a dial to go with it, and the glass ca ries calibration for each of the bands.



The circuit holds no surprises. It was selected because of its proved performance in the standard type of dual-wave receiver.

The task of getting five bands clearly own on one glass is, as you can agine, not a simple one. After some ought, it was decided to calibrate em in megacycles or kilocycles, as these its are now standard. Obviously it uld be impossible to include stations the short waves, as the hundreds of l-signs required, just wouldn't go on ordinary dial. Also, the rapid changes ich are taking place, would make y such markings quite useless, and they uld mislead rather than inform.

Anyone interested in short wave listen-, knows his way about in terms of gacycles and kilocycles, and a sonably accurate calibration of this e is all he requires.

At the present time, the dial is not tainable with stations marked on the adcast band. Again difficulties would se in marking such stations, as there more than 120 of them in Australia. en with the whole dial face available, s almost impossible to include them. However, if the demand is great ough, R.C.S. are prepared to print a ecial glass for this receiver with as any of the main stations included as ice will allow. It is up to you to let know if you would like such a glass, d it will be made available for a few nce. To change it for the one now plied is only a matter of a few min-es.

AND COVERAGES

The five bands covered are as follows:
No. 1. from 30mc. to 11mc.
No. 2. 16mc. to 5.5mc.
No. 3. 8mc. to 3.25mc.
No. 4. 4mc. to 1.5mc.
No. 5. 1600kc. to 550kc.

As you will notice there is a consid-able over-lap between the one band d the next. This has been done rposely, so that, in the first place, re is no danger of anything being lost, and secondly, so that at no time need the set be operated with too high a capacity-to-inductance ratio. It is much pref-erable to have a large coil tuned with a small condenser, than to have a small coil tuned with a large condenser. At the top end of the range, we would have such a large capacity that efficiency would be poor.

As it is, before it becomes necessary to mesh the condenser fully on any one band, the overlap point is reached at which we can flip over the coil-switch and start again on a smaller coil.

Also, it allows a smaller capacity tuning condenser to be used if desired, with the unit, and still have an overlap between bands.

COLOR CODE FOR CONNECTIONS

AERIAL SECTION:
- Red—Aerial.
- Green—Earth.
- Yellow—Condenser gang.
- Black—A.V.C.

R.F. SECTION:
- Red—R.F. plate.
- Green—B positive, 250 volts.
- Yellow—Condenser gang.
- Black—A.V.C.

OSCILLATOR SECTION:
- Red—Oscillator plate.
- Green—B positive, 100 volts.
- Yellow—Oscillator grid and gang.
- Copper Braid—Connect to chassis.

THE CIRCUIT

This just about disposes of the coil unit description. All the points we have mentioned will be seen in the diagrams and photographs. Now for the circuit of the set.

As you will see, this is a standard affair. We felt that the builder would feel rather more confident in adapting a well-known circuit in this case, than if we had evolved something out of the ordinary.

As it is, the hook-up is one noted for its high gain and satisfactory operation. As a matter of fact, it is almost exactly the same as one recommended by the valve manufacturers for the valves used, so you need have no fear about whether it will work or not!

Of course, an R.F. stage is employed, using a 6U7G or equivalent valve. This feeds into the converter—a 6K8G. This valve is generally agreed to be the best all-round converter, particularly for short wave operation. As this set will give results right down to 10 metres, we want to use the best converter we can.

The I.F. stage uses the 6G8G, diode-pentode, only the pentode section being used in the I.F. amplifier.

There are two diodes in this valve. One of them is used for detection, and the other for A.V.C. This allows us to keep the R.F. part of the set grouped to one side of the chassis, an advantage not to be scorned. Our layout has been worked out with a view to keeping leads and components grouped as compactly as possible.

This makes it a little harder than usual to show everything with the utmost clarity, but when building the set, actually there is no difficulty here at all.

A.V.C. CONNECTIONS

The A.V.C. connections are very simple. Series connection is used, mainly because it is very simple to connect with this type of unit. The two decoupling resistors are soldered direct to the wire link connecting to the converter grid return circuits (color-coded A.V.C.). The

second straddles right across to make contact on the I.F. transformer.

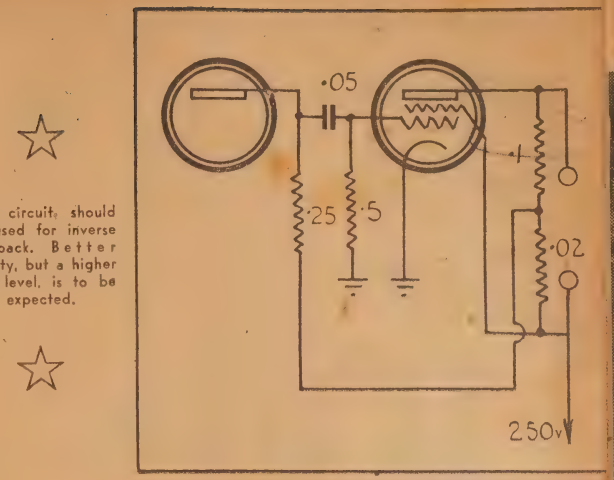
Separate bias resistors are used for the first three valves in the set. This is done as a precaution against instability. For best results on the very low wave-lengths, it is worth while taking all precautions to make sure there will be no "bugs" in the set when built.

When mounting components and wiring, try to group each stage together in such things as earth returns for instance. Ideally, all earth returns and bypasses for each stage should connect to the same point on the chassis. This is not always possible, but it is possible to return these to points not more than an inch or two apart.

EARTH CONNECTIONS

Another thing which is very important. The earth wiper-blades on the tuning gang must be connected direct to the chassis. Preferably, you should run a heavy tinned piece of wire from them, so that it connects to the chassis at a point as near as possible to the A.V.C. bypass condensers on the R.F. and converter stages. Remember that this wire is actually portion of the tuned circuit, and it is essential to have the return made as short as possible.

If you omit these connections, it means that all the tuned circuits are made complete through a common path which is the frame of the condenser



This circuit should be used for inverse feedback. Better quality, but a higher hum level, is to be expected.

AUDIO CIRCUIT

gang. This is most undesirable, as all kinds of coupling effects are possible.

The audio circuit we have used, employs the popular 6J7G-6V6G combination.

The 6J7G is used as a pentode audio amplifier, resistance coupled to the 6V6G.

This circuit gives a very high audio gain, in some ways almost too high. It does allow an enormous over-all in the receiver, which is valuable short wave work.

The only real objection to this circuit is that, because of the high audio gain which is there all the time, one must be very careful to keep the hum level down.

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This applies primarily to the grid circuit of the 6J7G, which is the one most likely to pick up induced voltages, with its comparatively high impedance input characteristics.

For this reason, the lead to the volume control must be shielded, and run across well away from the power transformer.

We spent quite some time hunting a bad hum in this set when first built, eventually finding that this lead, running about 1½ inches from the transformer, was sufficiently in the field to pick up hum.

We have a shrewd suspicion that the power transformer we were using was not a very good one, however, because we have never had this trouble so badly before. Still, we quote the case as an indication of how careful one must be of such matters.

The plate circuit of the valve is decoupled again to reduce hum. Many use an 8mfds. condenser here, but we found 5mfd. was sufficient for the purpose.

NO INVERSE FEEDBACK

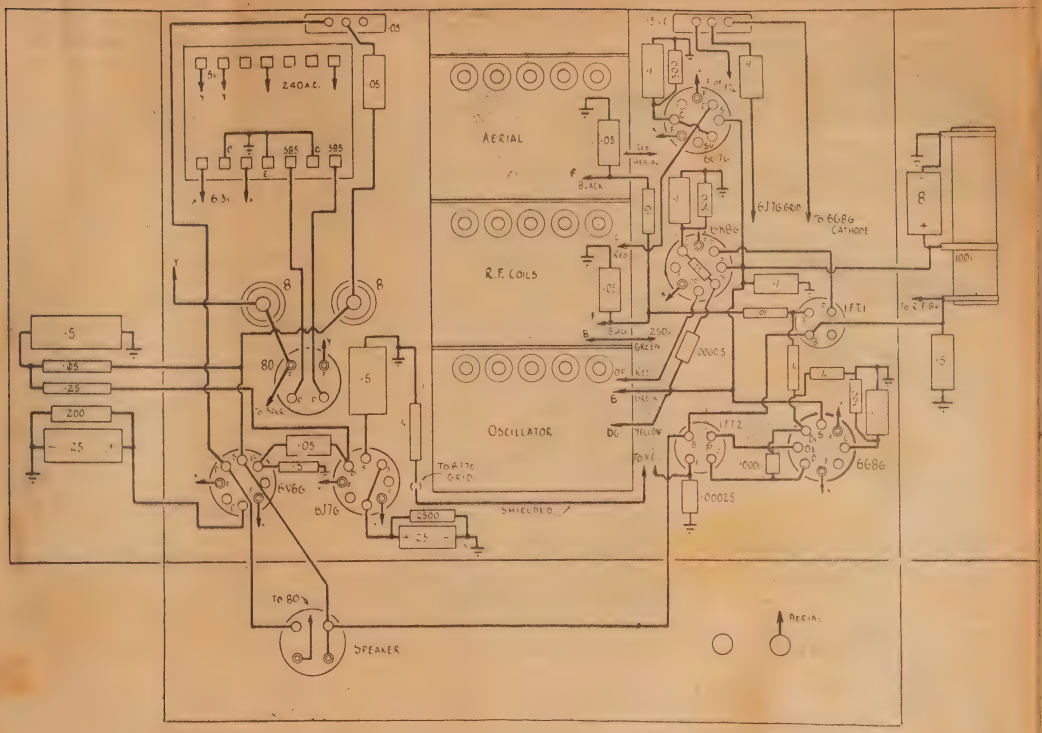
Personally, we always like to use inverse feedback wherever a beam power valve is employed in the output stage. We have not used it because, frankly, we do not like the percentage of hum in the output when wired up in the conventional simple circuit.

With this circuit, it is not permissible to de-couple the plate circuit of the 6J7G. We know that many manufactured sets used this circuit, and "got away with it," but without being unduly kind, we have heard many commercial receivers with a hum level we wouldn't inflict on our best enemy!

As a matter of fact, and we say this quite seriously, we are considering making it a rule in future to describe all major A.C. sets with a filter choke as standard equipment, in order to clean out hum. It is almost impossible to better a certain minimum with the standard field coil and two electrolytics, even though some receivers use up to 32mfds. of condenser on the far side of the speaker field. A filter choke doesn't cost much, but its effect is almost magical. There is no substitute for it, and half one's problems of de-coupling are wiped by cleaning up the power supply in the first place.

SHILLING POSTAL QUERY SERVICE

We have decided to revive the Postal Service by which your queries will be answered through the mail. If you desire a personal reply to your queries, send 1/- Postal Note, or Stamps to the value of 1/-, and we will do the rest! See page 76 in this issue for further particulars.



Here is the wiring diagram drawn to scale. All connections under the base are shown here.

A filter choke can be used with the set if desired in the normal manner, although for average use, you will find the results at present on a par with any other set of this type.

There is room for a choke to be bolted under the chassis at the back. It should be wired in immediately after the rectifier.

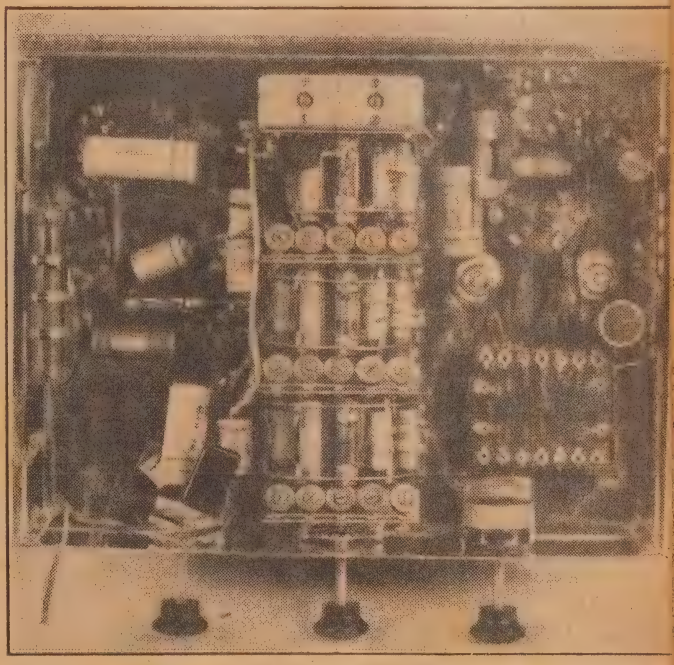
A standard type of tone control may be used, consisting of a 50,000 ohms resistor in series with a .05mfd. tubular condenser, wired between the plate and screen of the 6V6G.

The set is built up in the normal manner, just like any other receiver. There are no special precautions to be taken, other than those already mentioned. Just do all the things you know you should, but sometimes don't, such as connecting all earthing points together with heavy tinned wire, particularly if the chassis is a steel one. Keep plate and grid leads well away from each other and so on. The man who tackles this set won't need to be reminded of the importance attached to such things.

These kits as we have said, are special jobs, and are therefore tested and lined up at the factory. Therefore, you are almost certain to hear something on every band straight away, assuming of course, there are stations operating when you try!

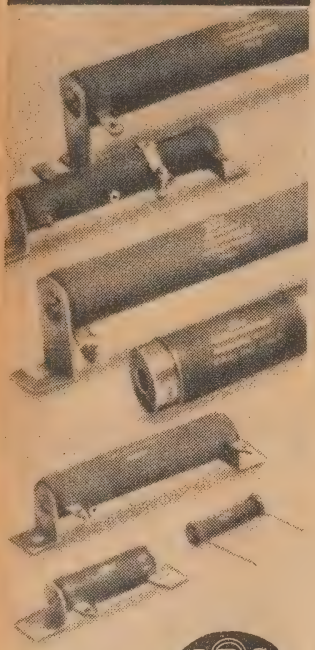
Therefore, your procedure should be to change the adjustments as little as possible.

You will have no difficulty in sorting



A picture taken from under the chassis. Compare this with the diagram above.

EXTRA PROTECTION!



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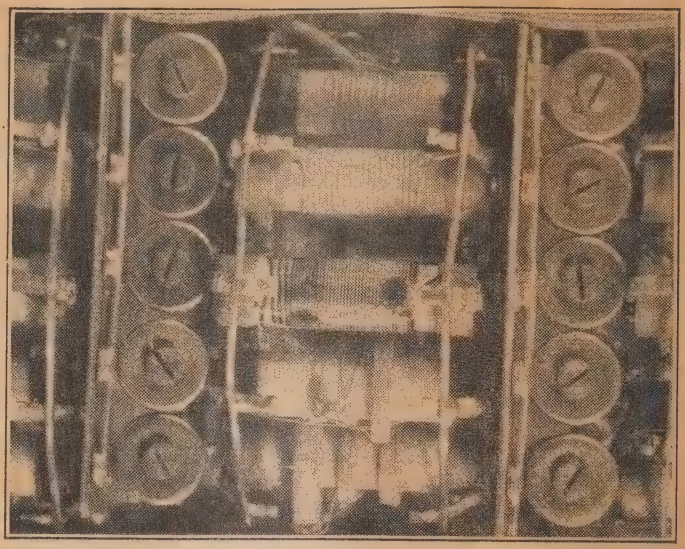
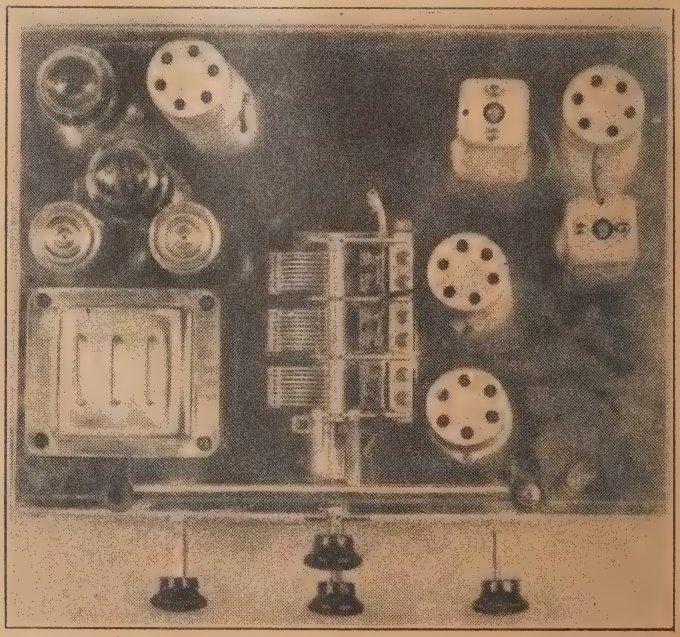


A close-up of one section of the coil unit. Note the use of air trimmers. The dimensions of the coils for each band are clearly seen here.

out which trimmer is which, because each is situated right next to its respective coil. We suggest that you leave the padders (where variable) and the oscillator trimmers well alone for a start. When you have tuned in a station, the tiniest touch to R.F. and aerial trimmers may be required for best volume. The wires from the unit when cut to size, should be just about right for the adjustments made at the factory. Any



This plan view of the chassis throws more light on the matter of layout.

bit you snip off shouldn't affect this at all.

A check with the dial on stations whose frequencies you know, will tell you how accurately the oscillator trimmers are lined. If the difference is worth worrying about, adjust the oscillator trimmers to rectify it, and re-line the others to suit. That is all you will need to do—the padding condenser for the two low-frequency bands is at the back of the assembly, but shouldn't need to be altered.

If you can't find any stations on the short waves to do your lining, you can probably make use of the set's noise level for the purpose, as long as you don't touch the oscillator trimmer. The latter must never be altered unless you are rechecking on a frequency from a station you are quite sure of, or from a good oscillator or signal generator.

A very slight touch on the intermediates can be made when everything else is in order. If these are of the iron cored, permeability tuned type, the adjustment is very critical, and you can't be too careful. If in doubt, leave them alone.

RESULTS

You will find this set an excellent performer on all bands. Don't expect to get too much on the 10 metre end, as only occasionally are stations heard there. Sometimes some Americans will come through at certain times of the day, but don't think the thing is all screwy even if you never hear a 10 metre signal. You will get plenty of signals from 13 metres upwards, to let you know the set really is working.

When completed you will have a receiver quite unique in many ways, for it is the first of its kind ever described in an Australian radio paper.

We will be very interested to hear from readers who have built up this set, because after having worked with R.C.S. to produce this coil assembly, we are very anxious that it should give to everybody the results we know it can give.

CONNECTIONS ABOVE BASE

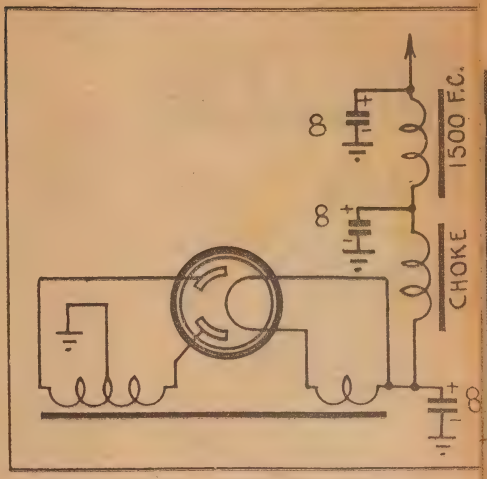
Connections above the base include those from the grids of the 6U7G and 6K8G, across to the fixed plates of the tuning gang. As the rear section of the gang tunes the oscillator coil, these connections will be made to the two front sections of the gang.

Some constructors will persist in placing shielding braid over these leads. That is definitely a bad practice. It might help to make a set stable, but if such measures should be necessary, it is a certain thing that something else is wrong with the set.

As it is not good practice to correct a fault with a fault, you should find out what is causing this instability, rather than kill it by such severe measures.

I.F. LEAD

While on the subject, this also applies to the I.F. stages. There is another above base connection from the 6U7G I.F. amplifier to the I.F. transformer. This lead should never be shielded with braid. If the lead is made as short as possible, so that only as much as necessary is outside the top of the can, that should be sufficient. Any instability is certain to be caused by some other fault in the set.



Here is the circuit to use if a filter choke is employed. An extra filter is also required. This circuit is advised if using inverse feedback.

The last above-base connection is that which runs from the grid of the 6U7G under the chassis, and thence to the volume control.

It is in order to use braided wire for this connection, because here we are not concerned about R.F. currents. If there are R.F. currents in this part of the circuit, they are not wanted, and the bypassing effect of the braid is, if anything, a help.

From an audio point of view, the capacity of the braid to earth does not matter. It is only important when a very high input resistance is in the circuit, and these conditions do not apply here.

As we have said, the high gain of the audio amplifier makes this grid rather a tricky one in picking up induced hum voltages, and shielding will help to av it.

The valve must be placed under a c just as are the R.F. amplifiers, otherw instability and hum are likely to appea

LOUDSPEAKER

Any good loud-speaker will suit t receiver. The only exceptions are t midget types, which are not able make full use of the set's output. T only time these should be used is wh the set is operated purely for a sho wave job, where quality of reproducti is not important. They will han voice frequencies reasonably well.

Otherwise, an 8 inch or a 10 in speaker should be used, and even t 12 inch types are not too large.

The input resistance should be 50 ohms. The field resistance should 2000 ohms if no filter choke is used, a 1500 ohms if the filter choke is include

NEW STATUS FOR INSTITUTE

W.I.A. TAKES OVER CHARTER

The January general meeting of the division will mark an important milestone in the history of the institute in this State. For some considerable time the council of the institute have been working hard to bring VK2 under the original charter issued in 1922. The January meeting will bring this work to a successful conclusion. It is of interest to note that the Wireless Institute of Australia was founded in 1910 and is now in its thirtieth year, and actually is the oldes tamateur organisation in the world.

The annual election of officers was to have taken place at this meeting, but as only seven nominations were received, a ballot has been rendered unnecessary. The only nominations received were: Messrs. Ackling, Fraser, Goyen, Horne, Peterson, Ryan and Treharne—all members of the retiring council.

Mr. R. A. Priddle, VK2RA, will be t lecturer at the January meeting, a he has chosen for his subject "Some Fa tors to be Considered in the Design the Modern Skyscraper." 2RA is a me ber of one of the largest firms of d signing engineers in Sydney, and so of the facts he will make known shou be of interest.

The Institute QSL Officer states th there are still a large number of car for nonmembers awaiting collection the bureau. Quite a number of Sou Americans, Africans and some of t difficult Europeans are lying arou and unless collected very soon will ha to be destroyed. Non-members shou write the QSL Officer, Box 1734J G.P.O., Sydney. An interesting sid light on QSL cards during the we was the return by the Censor of package addressed to a large Centr European Power!

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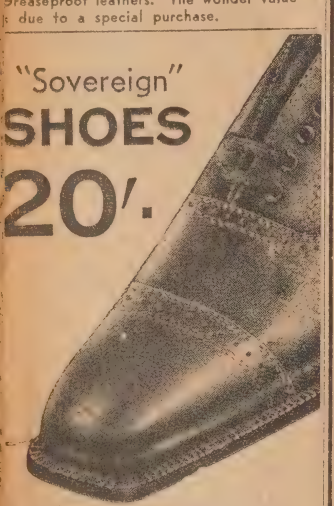

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BEFORE the Christmas holidays had commenced, and the paper had been on sale less than a fortnight, we saw a pile of letters in one radio store almost inches thick from people all over New South Wales, and from other States, inquiring for prices and enclosing the wherewithal for their parts.

This, of course, was only part of the business, for counter sales and inquiries were coming in all the time. Even the cabinet maker could scarcely keep pace with his orders, and finally resorted to making up cabinets in dozen lots, without waiting for the orders which he knew would come.

One radio firm built up a complete receiver which was left operating in the store. But not for long. It was sold for cash almost before anyone had a chance to hear it!

ECONOMY AND PERFORMANCE

The point which has intrigued so many people has been the amazing performance of this three-valve little wonder with such low battery consumption. This, of course, was due very largely to the special loop aerial which was made for it—much larger than the loops obtainable in the past.

In addition, the housing of the loop in the lid of the cabinet, and its consequent removal from the immediate vicinity of the chassis and batteries, allowed the full pick-up to be obtained. As a result, many found the addition of an outside aerial made very little difference to the performance, unless operating conditions were very bad.

So far we have received no reports of difficulties or snags in making up the Pentagrid Portable. No one evidently has had any trouble in getting it to operate, or in fitting it into the cabinet. Generally there are one or two who have not used components or a chassis the same size as we specified. Possibly our very straightforward remarks on deviating from specifications have had their effect! We hope so, for this practice can only result in poor satisfaction both for the builders and for ourselves.

SPEAKERS NOW HERE

Unfortunately, unavoidable conditions made speakers for the set very hard to obtain for a week or two after the issue appeared. Suitable speakers were very quickly snapped up by those who go' in early, but it seems that everyone sooner or later was entirely cleaned out!

However, we understand that the position has now become much better, and the speaker people are making every effort to have sufficient speakers available, despite the difficulty they have found with shipments of field magnets.

THE DUPLEX SINGLE

Almost as successful in its way has been the Duplex Single receiver, also described in the Christmas issue. Our mail has been filled with inquiries about this set. Evidently many are anxious to use the parts they have, or at least some of them, and we have been busy sorting things out for them.

However, there are plenty more good things to come! In next month's issue we will have still more winners for you!

ADJUSTABLE SHELVES

STRIPS of corrugated cardboard tacked to the inside of small cabinets make excellent shelf supports where lightweight objects are to be carried. The shelves themselves should be cut to fit and the edges rounded to slide into the corrugations.

NEW ROLA SPEAKERS

THE Rola Company announce the release of a new electro-dynamic speaker expressly designed for use in ultra-compact radio receivers. Known as K5, this speaker is of entirely new design and combines a high degree of efficiency with hitherto unobtained compactness. It will replace F4 when present small stocks of components of this speaker have been exhausted.

NEW MAGNET STRUCTURE

The magnet structure, cone housing and transformer have been arranged so that all parts of the speaker fit within a 5-inch diameter and occupy a maximum depth of 2 5-16in. The speaker is shallow in design, and is arranged so that when mounted on a chassis it takes no more space than a small radio valve. Yet despite its reduced dimensions, K5 preserves the essential ruggedness that is characteristic of all Rola speakers.

A special process of manufacture is employed to guarantee that none of the delicately adjusted components move from their original position. There are no screws, nuts or bolts in the assembly. Diaphragm, field coil and transformer have been designed to withstand the abnormally high temperatures developed in small cabinets.

BLIND GIRL SEES LIGHTNING

AT NEW YORK SHOW

When the General Electric exhibit closed for 1939 at the New York World's Fair, the 31,650th lightning bolt dinned into the ears of the last 600 persons in Steinmetz Hall's artificial lightning demonstrations. Never before had so many people seen so much lightning in one place.

BUT of the 2,694,165 persons who saw the man-made lightning, probably none derived so much from it as Helen Keller, the noted blind-and-deaf author and educator, who wrote to Dr. John H. Finley, of the "New York Times," upon the closing of the Fair:

"The artificial lightning was another unforgettable experience. It impressed me as nothing else with a sense of man, frail yet indomitable, mastering the dread smithies from which fiery bolts are hurled. As I sat there, taut but exultant, another wonder befell. The lightning spoke to me!—nay, it sang all through my frame in billowing, organ-like tones."

1½ MILLION ATTENDANCE

The General Electric "House of Magic" exceeded in one year at the New York Fair the attendance record which it set for two years combined at Chicago's Century of Progress. The attendance ran to slightly over 1,400,000, more than 100,000 than the record for Chicago.

And again one of the most appreciative of the season's audience in the "House of Magic" was Miss Keller, who wrote: "At the electrical demonstrations I perceived the gentle vibrations of light which had been converted into speech through the loud speaker. Who knows? —I may yet be greeted by colors talking into my hand, like words dropping from a friend's lips. It is most tantalising—these rumors of light wandering into the touch sphere like driftwood from continents unknown. Thus, amazingly, the years have borne me from the make-believe of Greek Mythology and the 'Arabian Nights' to realities that grasp the mantle of the flying imagination."

MUMMY TELEVISED

Some 27,000 visitors were interviewed in the General Electrical television studio, and the last visitor to speak in the studio was J. W. Starling, of The Hague, Holland. But the last official appearance before the television camera was made by Harwa, the 2800-year-old Egyptian mummy whose skeleton was X-rayed all summer in the exhibit of the General Electric X-Ray Corporation. Harwa is being shipped back to the field Museum of Natural History in Chicago, where he will be inspected to see how he weathered the summer on Flushing Meadows.

WHEREVER YOU GO THIS SUMMER...

Take a 1.4 Volt Portable!

CAMPING — motoring — yachting — picnicking — wherever you go, whatever you do outdoors this summer, TAKE A 1.4 VOLT PORTABLE RADIO ALONG! The perfect outdoor companion for sunny days, it brings you fun and music wherever you happen to be—at the click of a switch. Light, compact, requiring no earth or aerial, you can carry and use it anywhere — and being entirely self-contained (powered with dependable Eveready Dry Batteries) there is no accumulator to recharge, no outside plug or power point to bother about. Ask your radio dealer to demonstrate one of the latest models.

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RADIO BATTERIES

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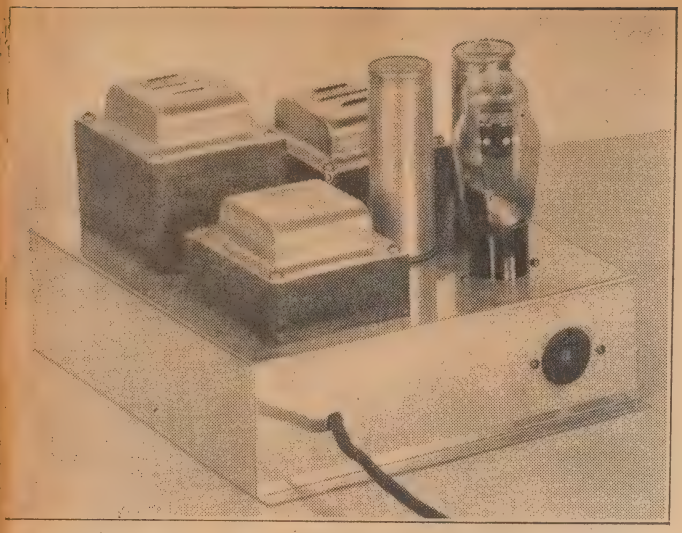
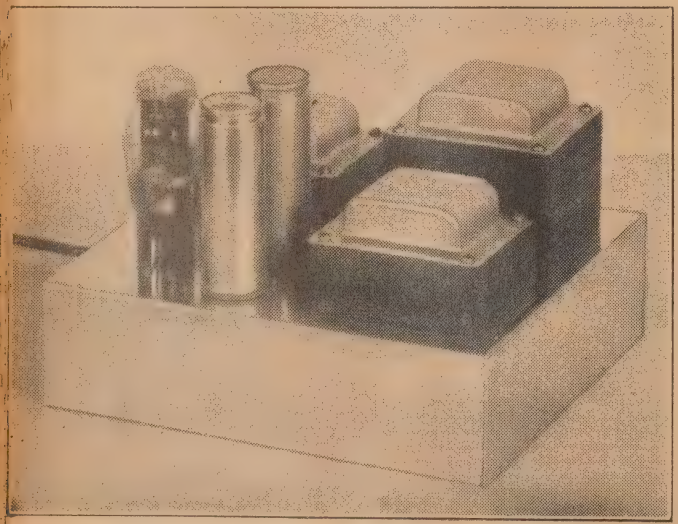


A general view of the power unit. The valve socket provides for quick plug-in.

A power supply which may be used with any number of experimental amplifiers, receivers, and even amateur transmitters, is a very handy thing for the radio enthusiast. As a rule, there is no objection to using a separate unit for this purpose, particularly when simple plug-in connection is possible. This power unit measures up to all these requirements.

A HANDY A.C. POWER SUPPLY

for experimental work



Another view of the unit. We suggest using filter condensers of a high rating. Ours were the Solar 600 peak volt type.

THERE is a far wider scope in radio as a hobby if a certain amount of experimenting can be carried out.

This is especially the case with amplifiers designed for high-quality reproduction from a radio tuner or from a gramophone pick-up.

The further you go with the amplifier the keener you get, and a perfection which is completely satisfying is seldom achieved without a lot of keen experimenting with aural judgment of the results obtained from each experiment.

A great assistance to experimenting, especially as regards the financial angle, is the use of a versatile power supply unit.

With such a unit the changes in circuit of the amplifier can be carried out with little expense, the smaller components, such as resistors and condensers, being quite cheap.

THE REQUIREMENTS

For a suitable power unit we would suggest one capable of supplying an adequately filtered high-tension supply of up to 500 volts, at current drains of up to 200 milliamperes, and with heater supplies suitable for all the popular types of modern valves.

ISOLATION

When considering the assembly of a power supply unit of this kind, it is natural to think of winding up transformers of suitable type, but investigation shows that power transformers are available at cheap prices, and in most cases the complete transformers are available at a price lower than the cost of the materials!

In order to allow the high tension voltages or filament voltages to be varied independently, and on the grounds of economy, it is advisable to have two separate transformers, one for the filaments and the other for the high tension, each with primaries tapped for 220, 240 and 260 volts.

By using alternative tappings the voltages can be varied within limits, and as the rating of each transformer will not exceed a hundred watts, a fairly small core of standard receiver-type laminations can be used, **making the cost of the two separate transformers considerably lower than the price of a special job big enough to carry all the windings.**

FILTER

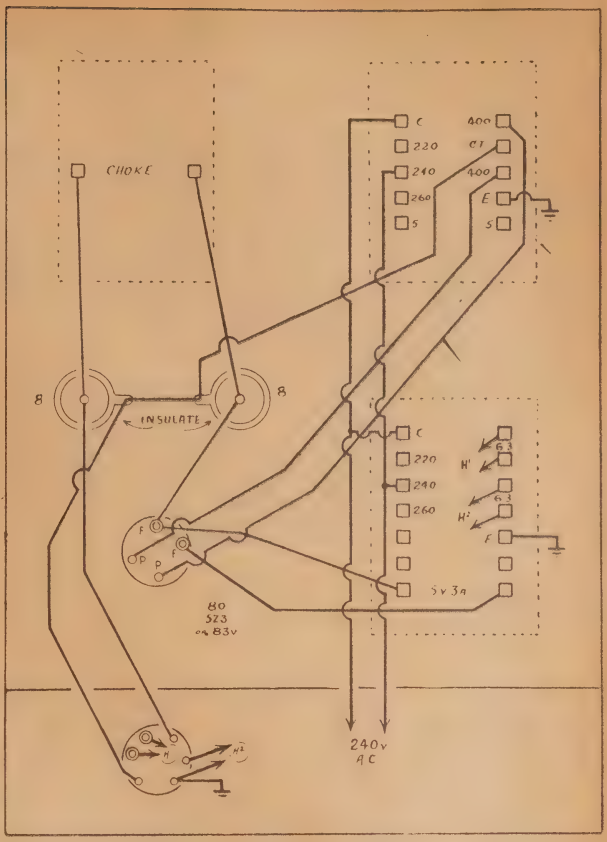
A filter choke with heavy wire is required, and two filter condensers.

For the latter we strongly recommend those rated at 8 mfds. at 600 volts. These are capable of withstanding peak volts of this rating, and will work well on voltages of up to 500 volts r.m.s. They are ideal for equipment as used in the original power unit shown in the photographs.

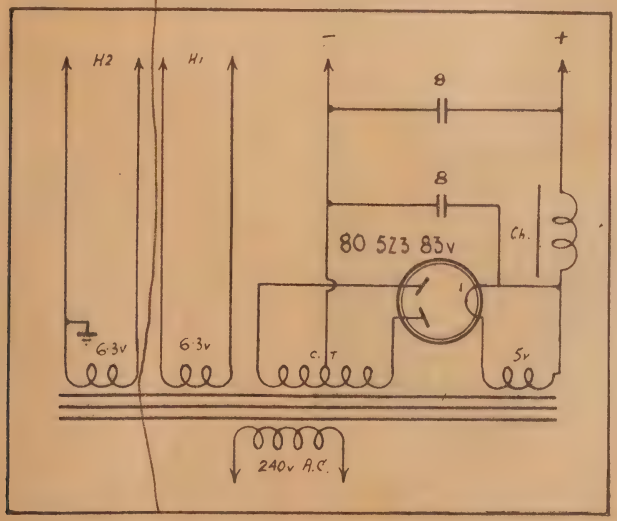
TAPPINGS

Most modern valves are of the 6.3 volt heater rating, and so we suggest at least two of these windings on the filament transformer, each capable of supplying up to a couple of amperes.

Another winding of 4 volts at 5 amperes, tapped at 2.5 volts, is handy,



The wiring diagram shows all connections under the base.



The circuit is the same as would be used in the average receiver or amplifier

and, of course, there should be a 5-v winding at 3 amperes for the rectif

If there is any chance of the u being used with 50 type valves, it wo be a good idea to have one of the windings made up as a 7.5 wind tapped at 6.3.

For the high tension transformer suggest 400 volts at 200 milliamps, t winding being capable of supplying to 500 volts at lower current drain with the primary tappings used to vantage.

It is not a bad plan to have a 5 v 3 amp. winding on the high tens transformer for rectifier use under c tain switching conditions.

Transformers wound to requi specifications can be ordered throu any good dealer.

As detailed the unit is suitable for with the 80, 83V or 5Z3 types of r tifier valves. Lower output voltages v be obtained with the 80, but it is e tirely suitable if the total current dr on the unit is kept below 100 millia peres.

For higher current drain the 5Z3 recommended. The 83V, being a spec type of rectifier, results in the act

(Continued on Page 75)

AMATEURS and the BYRD EXPEDITION

BASES WILL USE RADIO LINKS

Hullo CQ, Antarctica. Calling KC4USA, KC4USB, or the Snow Cruiser KC4USC. Some readers may have noticed several paragraphs in the dailies stating that Rear-Admiral Richard Byrd had called at Auckland, New Zealand, on his trip to the South Pole, but what the papers did not tell us was the part that Amateur Radio is going to play in this attempt to colonise the white wastes of Antarctica, made famous by Captain Scott and his gallant band.

By W. G. RYAN

WO main bases will be made, known as East and West Base respectively, and they will be over 600 miles apart. In addition, five outs will also be in operation. Coned light Army tanks will be used hauling sledges and a larger type of k to be known as the Snow Cruiser n its own pick-a-back plane will be t for general survey work.

ll outposts and planes will be in comnication with the bases by means radio!

o doubt you are wondering by now ere the ubiquitous "ham" comes into picture. Second in command of the munications section is Elmer L. nplugh, W1LWD at East Base, while West Base will be ex-W4CTA and the rator on the Snow Cruiser will be L. Ferranto, W6NDH.

ONTACT WITH U.S.A.

ll personal traffic between the exition and the Americas will be idled by "ham" radio, and the follow- amateur calls have been assigned: 4USA, West Base; KC4USB, East e; and KC4USC, the Snow Cruiser; frequencies to be used will be 7075, 50 and 28,300kcs. Exact location of bases is not known, but is anticied that there will be a difference of hours between the peak periods of two stations.

nfortunately, the part of the VK in se transmissions will be that of a ener only, and VK2DG, Keith Rud- of Abermain, who contacted the sian station, UPOL, at the North e, will no doubt be listening very hard l regretting that he cannot use his in an endeavor to contact either of stations, and, if successful, quite hfully say that he has "worked all tinents."

efore leaving this expedition, it may well to mention that quite a number broadcasts will take place from the es from time to time, and these should picked up direct or via some of the erican broadcasting stations.

MATEURS AND WAR

y now news is gradually coming to d telling us how the war has affected amateur in different parts of the rld. Perhaps the greatest sacrifices ve been made by the "G" (English) ms.

ll licences were terminated on Sepber 1 and gear confiscated. The .G.B. made a plea that transmitting paratus should be sealed, but this was overruled by the Post Office people.

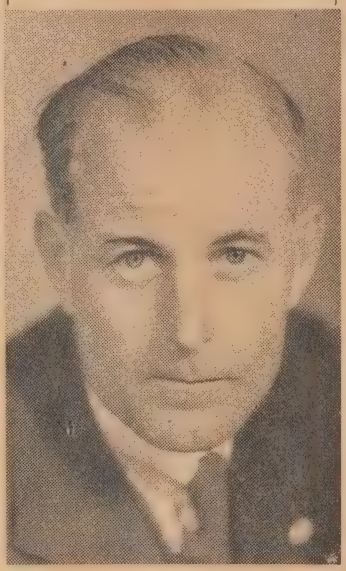
In many cases, unskilled men were sent out to recover the gear, resulting in a first-class muddle. One very well-known "G," arriving home, had some reason for believing his shack had received the full force of an aerial bomb! After some representations had been made, receivers were allowed to be used.

In France the Reseau des Emetteurs Francais (R.E.F.) has decided to completely discontinue activities owing to the whole of the executive and administrative staffs being called to the colors.

An interesting paragraph in Q.S.T. regarding the "D" "hams" reads as follows: "It is expected of every D.A.S.D. member that he makes available his knowledge and ability, as well as the apparatus and material at his disposal, and fulfil the duty assigned to him by his superiors." It has been stated that several amateur stations in Germany are still active, but I think that A. Milne, G2MI, sums up the situation when he says, "Some of the rare Dx pirates have turned belligerent."

South Africa! For some time after activities had ceased here in Australia ZS's were still active, and many questions were asked why Australian stations had to close down. All good things come to an end, and on 29/10/'39 all ZS's closed down. In Cuba, amateur stations had to close down, but expect to be again in operation very soon. Canadian stations also had a much longer run than the VK's. Netherlands, Norway, Sweden and Finland are also inactive. The Danish Society, Experimenterende Danske Radioamatorer (E.D.R.), had, on August 26, been successful in obtaining a small section of the 160-metre band for their members, but unfortunately the OZ's were closed down on October 1!

W.I.A. EXECUTIVE



Mr. C. Horne, hon. secretary of the Wireless Institute of Australia, N.S.W. division. He can tell you anything you want to know about amateur radio. Address: C/o W.I.A., Box 1734JJ, Sydney Post Office.

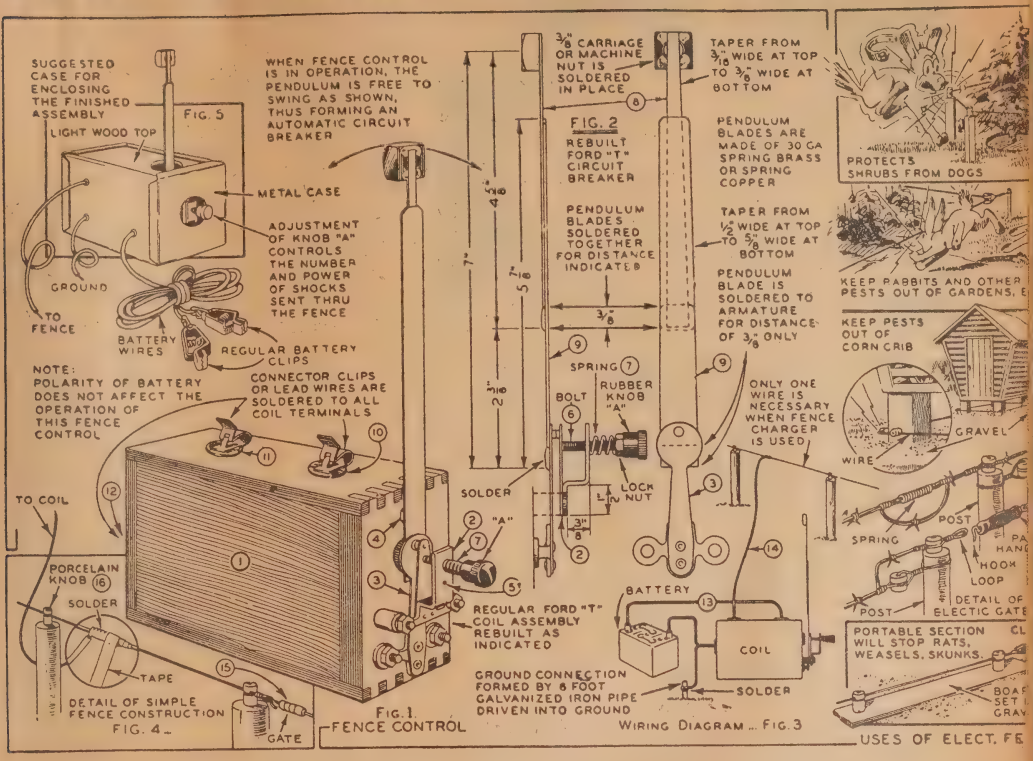
ULTRA-HIGH WORK

Interest in the Ultra-Highs is steadily increasing in the U.S.A., and the latest development is the formation of a special section in Q.S.T. under the guidance of E. P. Tilton, W1HDQ. Prior to the outbreak of war quite a lot of work had been done on 56 mc. and on 17/8/'39 the first England-Netherlands qso took place. It would appear that very little interest has been taken in England regarding frequencies above 56 mc., but in the States the opposite seems to be the case these days, many of the 56 mc. experimenters migrating to 112 mc. and 224 mc.

NO 112 MC. BAND!

Getting closer to home, it is with regret that the Wireless Institute of Australia announces that the Department of the Navy has refused a request that permission be granted to amateurs in Australia to use 112 mc. Shortly after the ban on transmitting was announced the Institute made a request to the P.M.G.'s Department for the use of 56 and 112 mcs. It was felt that should this be granted, quite a large amount of idle gear could be put to good use without interfering with any commercial service, and further, the Australian "ham" would be on the air.

HOW TO MAKE AN ELECTRIC FENCE


SUGGESTED CASE FOR ENCLOSING THE FINISHED ASSEMBLY
FIG. 5
LIGHT WOOD TOP
METAL CASE
GROUND
TO FENCE
BATTERY WIRES
REGULAR BATTERY CLIPS
NOTE: POLARITY OF BATTERY DOES NOT AFFECT THE OPERATION OF THIS FENCE CONTROL
CONNECTOR CLIPS OR LEAD WIRES ARE SOLDERED TO ALL COIL TERMINALS
ADJUSTMENT OF KNOB "A" CONTROLS THE NUMBER AND POWER OF SHOCKS SENT THRU THE FENCE
WHEN FENCE CONTROL IS IN OPERATION, THE PENDULUM IS FREE TO SWING AS SHOWN, THUS FORMING AN AUTOMATIC CIRCUIT BREAKER
TO COIL
PORCELAIN KNOB
SOLDER
TAPE
DETAIL OF SIMPLE FENCE CONSTRUCTION
FIG. 4
GATE
FIG. 1
FENCE CONTROL
3/8 CARRIAGE OR MACHINE NUT IS SOLDERED IN PLACE
FIG. 2
REBUILT FORD "T" CIRCUIT BREAKER
PENDULUM BLADES SOLDERED TOGETHER FOR DISTANCE INDICATED
SPRING
BOLT
RUBBER KNOB "A"
SOLDER
LOCK NUT
"A"
REGULAR FORD "T" COIL ASSEMBLY REBUILT AS INDICATED
GROUND CONNECTION FORMED BY 6 FOOT GALVANIZED IRON PIPE DRIVEN INTO GROUND
TAPER FROM 3/16" WIDE AT TOP TO 3/8" WIDE AT BOTTOM
PENDULUM BLADES ARE MADE OF 30 GA SPRING BRASS OR SPRING COPPER
TAPER FROM 1/2" WIDE AT TOP TO 5/8" WIDE AT BOTTOM
PENDULUM BLADE IS SOLDERED TO ARMATURE FOR DISTANCE OF 3/8" ONLY
ONLY ONE WIRE IS NECESSARY WHEN FENCE CHARGER IS USED
BATTERY
COIL
SOLDER
WIRING DIAGRAM ... FIG. 3
PROTECTS SHRUBS FROM DOGS
KEEP RABBITS AND OTHER PESTS OUT OF GARDENS.
KEEP PESTS OUT OF CORN CRIB
GRAVEL
WIRE
SPRING
POST
HOOK
LOOP
DETAIL OF ELECTIC GATE
PORTABLE SECTION WILL STOP RATS, WEASELS, SKUNKS.
USES OF ELECT. FE

This diagram gives full instructional details of the electric fence unit, and the methods of using it.

From time to time, readers have requested us to supply details of the construction of an electric fence. Electric fences aren't used in the city, and we have never been able to carry out the experiments necessary to develop apparatus. Recently a reader sent us this extract from a folder issued by the "Le-Jay" Manufacturing Co. of America which seems to offer considerable possibilities. We are sure that many readers will be interested to try the easily made unit for themselves.

AN electric fence charger operating on a six volt battery and capable of charging two or three miles of fence. However, if you do a perfect job of insulation over the entire circuit, especially noting that posts are as far apart as possible, then the unit will handle at least four to six miles of fencing.

HIGH VOLTAGE—LOW CURRENT

Reason for this is very simple—the control puts a high voltage low current shock into the fence, and because it is of high voltage its tendency for leakage is very great, and a certain amount of loss will incur at every post or point of insulation regardless of type of insulator. (Therefore, as above mentioned, be sure to have as few posts per mile as possible.) You can readily understand why good insulation is of vital importance and why we recommend the use of porcelain insulators.

Single wire rences charged with electricity do the work of costly four or five strand barbed wire fences. The charged single wire can often replace expensive woven wire enclosures.

The fencing of livestock is no doubt the most important application of the charged single wire, yet there is no limit to the number of uses. For instance, with aid of a real low fence, rats and mice can absolutely be kept out of corn cribs, granaries, &c.

By placing a single wire on a board, then embedding the board flush into the ground (wire about 2in. above board and suspended with porcelain insulator), then encircle hen house or entire ch fences, you absolutely keep out sk weasels, rats and all other thi animals. Once they get shocked stay away. Easily keep dogs away shrubs, cats away from fish r rabbits out of gardens, coyotes o grazing grounds, and other unwe intruders from places they are wanted.

The fence does not need to be i continuous length; it may have branches and loops as are needed so they are all connected. The wire is recommended for livestock, just bare wire may be used for the animals.

Once animals become acquainte the electric fence the unit may be off for days at a time without any t

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DIRECTIONS

First obtain a Model "T" Ford spark coil (1) in good condition (see Fig. 1). Remove the coil points (2) and (3) and cut off the point adjustment screw close to the nut (4). Remove the little rivet (5) in the coil point (2). Now carefully bend the point support (2) into the shape indicated in Fig. 2. This bending must be done slowly, and a little at a time, to avoid breaking. The end of the point support (2) may be cut off to a convenient length. Drill a hole in the point support (2) and tap it to receive the bolt (6), which is a 6-32, 8-32 or 10-32 bolt, on the end of which a lock nut and small rubber knob "A" are fitted. The tension spring (7) is the one which was used on the adjusting screw cut from the coil (1) at (4). The small knob "A" may be found on an old "B" battery, or perhaps on the terminal post of an old radio.

PENDULUM BLADES

From 30 gauge spring brass, or spring copper, cut the two pendulum blades according to the dimensions given (see Fig. 2). Solder a ⅜in. carriage nut to the top end of blade (8). Solder large end of blade (9) to the coil point (3), allowing the solder to grip for a distance of only ⅛in. Now clamp the two blades (8) and (9) together in the position shown, and solder them as indicated (see Fig. 2), again allowing the solder to grip for only ⅛in. Now replace the rebuilt coil point assembly as in Fig. 1.

To the coil points (10), (11) and (12) connector clips can be soldered, or if you do not have clips just solder on wires without clips. All wiring must be heavy rubber covered to avoid any possibility of a high tension short circuit. Regular battery clips are used on the battery wires.

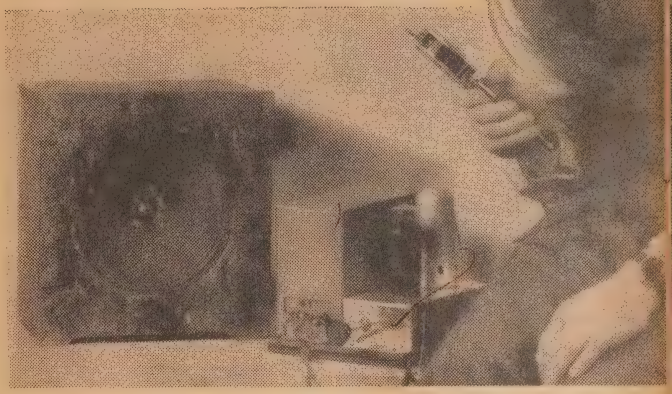
WIRING DIAGRAM

The wiring diagram (see Fig. 3) shows a wire from coil terminal (10) to the battery. In this wire, an "OFF" and "ON" switch may be inserted at (13), but is not necessary. From coil terminal (11) a wire is run directly to the fence. From coil terminal (12) run one wire to the other side of the battery, and one wire to a good ground connection. This ground connection is made by soldering the wire to a six-foot length of galvanised iron pipe, or other suitable rod driven into the earth. Moisten ground near this pipe occasionally during dry weather which will help to make shock more effective.

Fig. 4 shows the method of making the connection to the shock wire of the fence. Only one wire is necessary when the fence is electrically controlled. The shock wire is mounted on porcelain knobs (16). All splices in the fence must be thoroughly cleaned and soldered.

To form a gate in the electric fence, which may be opened or closed without danger of a shock while the control is operating, form a loop in the main wire into which a connecting hook may be fitted. A piece of inner tube is taped around the gate wire to form an insulating handle (15).

A SIMPLE VIBRATOR TYPE POWER AMPLIFIER



A close-up of the apparatus in use.

Here is a simple vibrator-operated amplifier with a multitude of uses. Originally designed as a simple public-address system, it could be used wherever medium output is required from a 6-volt battery source.

THE use of public address equipment has grown to such proportions during the last year or two as to make this one of the most important phases of radio. Every outdoor or indoor gathering these days has its own sound system, through which voice or music is amplified, and distributed as required.

Such sound systems vary considerably in size and power. For instance, at the World's Fair in U.S.A., thousands of watts were used to stage some of the most spectacular sound presentations ever heard, with loud speakers actually built into the ground in order to obtain horns large enough.

At the other end of the scale we could place the inter-office systems which are now seen in most big buildings. The audio power used here is very small, and the complexity of the wiring is the only real complication.

Or if we wanted to go smaller still, we could quote the baby amplifiers used for deaf-aid systems and special work of this nature.

OUTDOOR WORK

As far as the average man is concerned, an amplifier with an output of say three watts, for use at small outdoor gatherings, is probably of greater interest than any other.

In the first place it is well within his means to construct, as the parts list is quite modest. Secondly, it is easy to build, for a very simple circuit, and standard components, may be employed. And lastly, it will do almost any job at all under reasonable conditions, and providing the crowd does not run into thousands.

POWER REQUIRED

Many sound systems may be operated where the A.C. is available. In fact, where high-powered installati are concerned, this is almost a necess

But in the case of a portable u it is not practicable to depend on power. Only occasionally will the s tem be used near a suitable power o let. We need something which operate from a power source just portable as the amplifier itself.

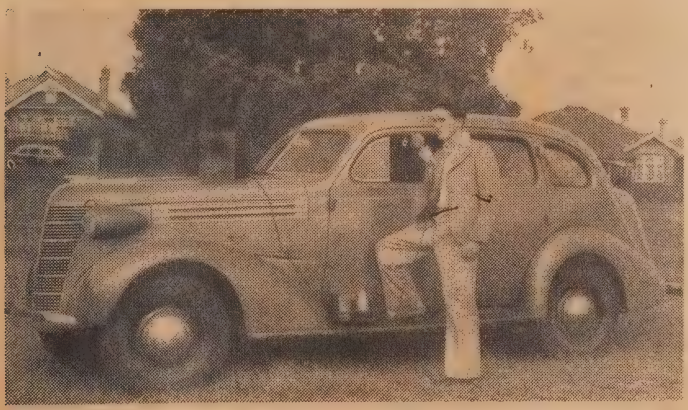
For this reason, when considering construction of an amplifier for p able work, we set out with the kn ledge that 240 A.C. was "out" fi the start.

USE OF VIBRATOR UNIT

As we have said, a low-powered should have an output of abou watts to be really effective. Prop used, this is enough to handle hund of small jobs. The original gear built up for use at the meetings the Model Aeronautical Associat where several hundred people are l ly to attend to witness model fl contests in the open air.

It has proved itself very effe indeed for this work, and is extrem easy to handle.

The secret of the design is the of a vibrator power supply. This used to generate the high tension



And here it is on the job. The speaker should be placed as high as possible for best results.

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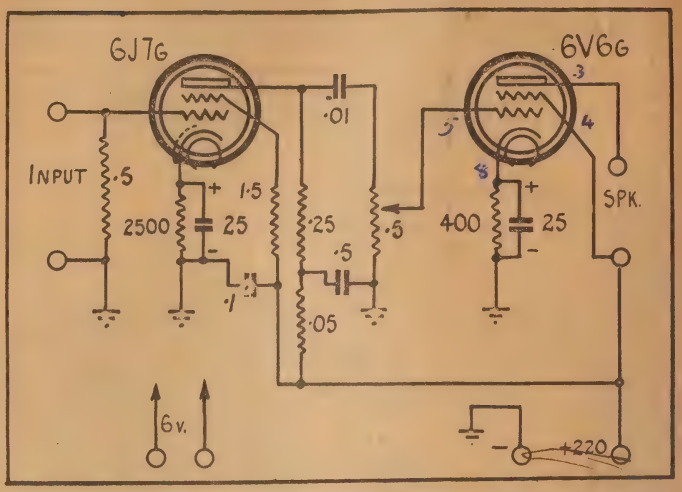
ADDRESS _____

THE AMPLIFIER CIRCUIT



The circuit is quite conventional except for a few values of components which differ from those generally employed.

the amplifier. It in turn is operated from a 6-volt storage battery from which it draws three or four amps of current.

The idea, of course, is to hitch the amplifier to a handy car battery which will almost certainly be a 6-volt type, and use it for the source of power.

At a meeting such as those mentioned above, there is certain to be a car on the spot, and more than likely, the operator of the amplifier will have brought it in a car anyhow. The drain on the battery is not enough to flatten it, presuming it to be in good condition.

Of course, a separate accumulator of 6 volts can be used if required, quite independently of the car itself. This would be necessary if the amplifier were to be used at a spot where the car could not be parked.

PARTS LIST

1 base 6¾in. x 4in. x 1¾in.
1 vibrator power supply, 220 v. at 60 m.a.
2 25 mfds. electrolytics.
1 .5 mfds. tubular condenser.
1 .1 mfds. tubular condenser.
1 .01 mfds. mica condenser.
1 1.5 meg. resistor.
1 .5 meg. resistor.
1 .25 meg. resistor.
1 .05 meg. resistor.
1 2500 ohms W.W. resistor.
1 400 ohms W.W. resistor.
1 .5 meg. potentiometer.
2 Octal sockets.
Valves—6J7G, 6V6G.
Hook-up wire, etc.
1 microphone D104.
1 Permagnetic speaker matched 7000 to 10,000 ohms load.

SUITABLE TYPES

The ordinary vibrator unit as used for radio receivers is not really suitable for such an amplifier. Such a unit has been designed primarily for economy, and generally delivers about 135 volts at about 25 mills.

This is ample for the average radio receiver, but not enough for the power amplifier. After all, we can't get something for nothing, and if we want the audio power, we must first of all have the high tension to produce it.

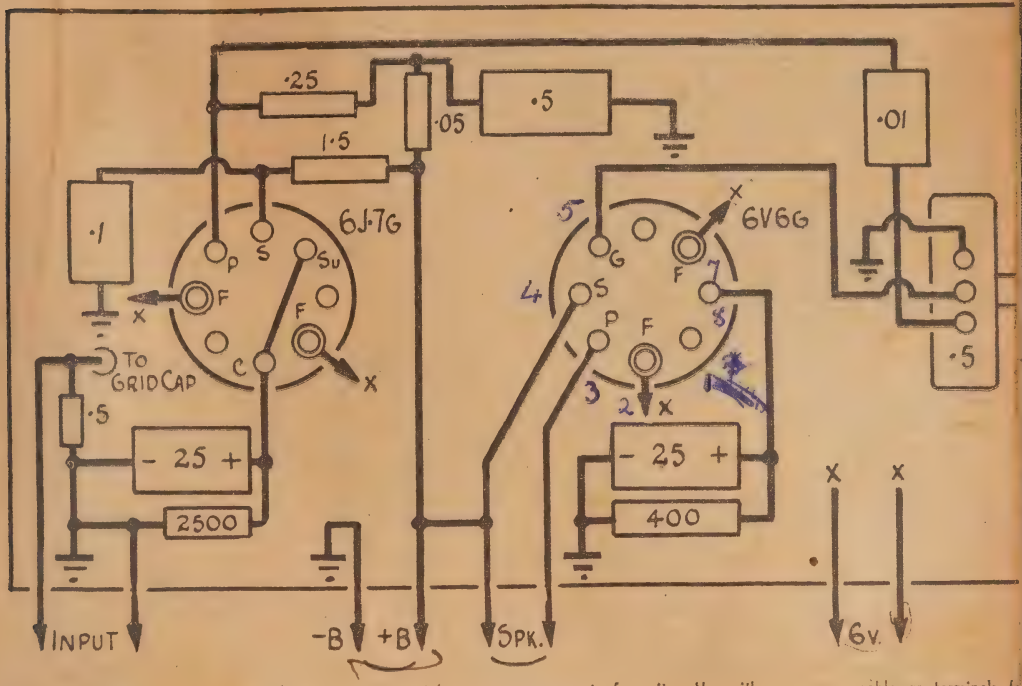
Therefore we employ a larger unit which is rated to give about 220 volts at 60 mills. This is sufficient to operate one of the regular output valves as used in radio receivers, almost to its full limits, and in any case, should provide us with something like the 3 watts we require.

THE AMPLIFIER

Before going any further, let us have a look at the equipment.

The amplifier itself is a very simple affair, and the circuit quite straightforward and conventional. As we desired to use a crystal microphone, fairly high gain was essential. So we start off with a pentode valve as a screen-grid audio amplifier, resistance

☆ WIRING DIAGRAM — FULL SIZE ☆



The wiring diagram is drawn actual size, so you can take your measurements from it. Use either a power cable or terminals fo connections.

coupled to a high-gain output pentode or beam power valve.

The most suitable types are those marked—the 6J7G, and the 6V6G. The 6J7G is the modern equivalent of the 6C6, which latter valve was actually used in the original. The only difference is in the matter of base connections, the 6F7G having an Octal base and the 6C6 a six-pin base.

So if you have a 6C6 on hand, you can use it.

The output valve is a 6V6G, well-known as the smaller of the two beam power valves. Operated normally, this valve will give about 4½ watts of audio. However, we haven't quite the full voltage for it, so that this figure would not be obtained without a certain amount of distortion.

It must be remembered, however, that high quality is not required in an amplifier designed primarily for speech work, and we can therefore push the output higher than we could otherwise.

LOW POWER DRAIN

In order to keep the drain on the power supply as low as possible, the output valve is rather overbiased, which however, does not appear to affect its operation to any great extent.

The pentode circuit uses the ordinary series feed for the screen through a resistance of 1.5 megs. and the plate circuit is decoupled in the normal manner.

Cathode bias is used for both valves.

The filament supply is obtained direct from the accumulator or car battery, as the valves both require 6 volts for the filaments. The total drain here is only .75 amps., the rest of the drain being accounted for by the vibrator unit.

The revised operating conditions for the valve will make a fairly high speaker load necessary for the highest output. The exact load is hard to specify because first of all, measurements would be required to obtain such a figure, and it would only apply for a given voltage and current. However, anything between say 7000 and 10,000 ohms should be quite satisfactory, in place of the 5000 ohms load generally used for this valve.

The speaker of course, will be a permagnetic type. An ordinary 8-inch speaker was used with the original. The latest types of permagnetic speakers have really remarkable sensitivity figures, and we suggest that you use the best you are able to find.

Various devices are adopted from time to time, to give a directional effect to speakers used in public address systems. The type one sees most often is the horn or flare, the purpose of which is to direct the sound a a specified channel.

This is quite all right under circ stances which call for highly con trated sound, but in our case, i probable that such things will no required. And of course, to get the results from them they have to carefully worked out, and cost mo

It may be that a short flare a 18 inches or two feet long) place front of the speaker, might be an provement—experiment is quite per sible and may be profitable.

However, in most cases, the spe can be mounted in a small cabinet, placed on the roof of the car, for stance, or suspended from some ha pole or tree so that it is well a head height. It is useless to par closer to the ground, as the sound probably be mopped up before it a chance to make itself heard.

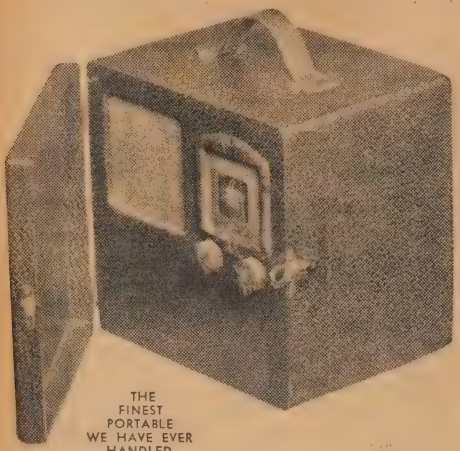
CONSTRUCTION

Making the amplifier is very sin We have given here a full sized wi diagram of the original, so that can make your measurements fro There are no critical points to watched, or snags which might p your undoing. Nothing could be pler.

The leads may be run direct to

THE PENTAGRID PORTABLE THREE

FULLY DESCRIBED IN THE CHRISTMAS ISSUE.



THE FINEST PORTABLE WE HAVE EVER HANDLED.

Build it yourself! It's quite simple. The chassis is drilled to specification, and the coil kit is all carefully marked, and what is more, we check all of the parts before delivery. For both tonal quality and long distance reception this powerful portable Receiver is unsurpassed. Write for our detailed parts list.

Same day mail order service. All goods carefully tested before despatch.

HOME CONSTRUCTORS!

PLACE YOUR ORDER WITH

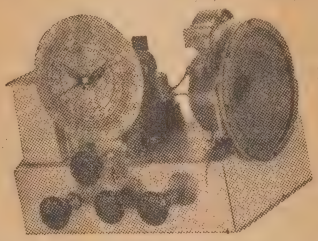
The Invincible Radio & Electrical Pty. Ltd., 102 Clarence St., Sydney.

We are the RECOGNISED "RADIO & HOBBIES" KITSET SPECIALISTS and supply only the correct and actual brands of components as used by the Technical Editor in his construction of the original models.

Write, phone or call for our detailed price lists available for all of our quality kitsets.

THE 1939 DUPLEX SINGLE

DESCRIBED IN THE CHRISTMAS ISSUE



This receiver employs only one valve, the new ID8GT, which in itself is equal in performance to any average 3-valve receiver. Write for detailed parts list. Full stocks on hand. Excellent reports to hand from all parts of Australia. It's a beauty.

This Month's Sets
The All-Wave 6/40.
The Vibrator Amplifier.
Don't fail to get our quotation. Our Prices are Right.

INVINCIBLE RADIO & ELECTRICAL Pty. Ltd.

SHOWROOMS: 102 CLARENCE STREET, SYDNEY.

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AMPLION

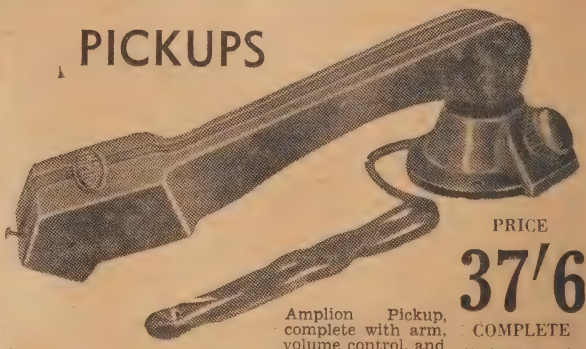
Electrically Welded

LOUD SPEAKERS

Amplion's new 1940 range of Electrically Welded Speakers combine every feature of faultless sound reproduction. . . . Extended Frequency range, Greater Output, Sealed Transformers, Complete Dustproofing, larger Cone Areas.

"All Wave." 6/40; 8E12, 8 inch Electro, 34/-; 10E12, issue, specify 7P14, 7 inch 14oz. magnet, 40/6. For the "All Wave." 4/60; 8E12, 8 inch Electro, 34/-; 10E12, 10 inch, Electro 38/6; 12E12, 12 inch Electro, 43/-; 12E22, 12 inch de Luxe Electro, 56/-.

PICKUPS



Amplion Pickup, complete with arm, volume control, and pickup rest.

PRICE **37/6** COMPLETE

Fitted to your needs . . . . and your purse! These Amplion Pickups combine excellent reproduction, minimum tracking error and average output of ¾ volt.

- Sparkling Treble.
- Brilliant Middle Register.
- Full Bass.
- Free from Resonance.
- True Tangent Angle Head.
- Good Frequency Response.
- All Bakelite Moulding.

Obtainable from all leading wholesalers and dealers.

AMPLION (A'sia.) Pty. Ltd.

382 KENT ST., SYDNEY.

Please send, without obligation, Amplion Pickup leaflet with Free Stroboscope and new Speaker Folder.

NAME .....

ADDRESS .....

power supply, battery, and speaker, or terminals may be used for their connection. Actually the only connections which will need removing from the unit when packing up are those for the speaker, and the microphone. As the amplifier and vibrator are mounted in a common base-board, the power connections between them need not be disturbed.

The leads to the battery might terminate in large battery clips, for quick application and removal.

THE MICROPHONE

The original amplifier made use of a popular crystal microphone, the D-104 type. This was selected because it is reasonably priced, needs no batteries or transformers, and has enough output to give good results if the operator has a good voice. Some of the better quality microphones of crystal and other types, have too low an output to give good results without the use of an extra stage of amplification

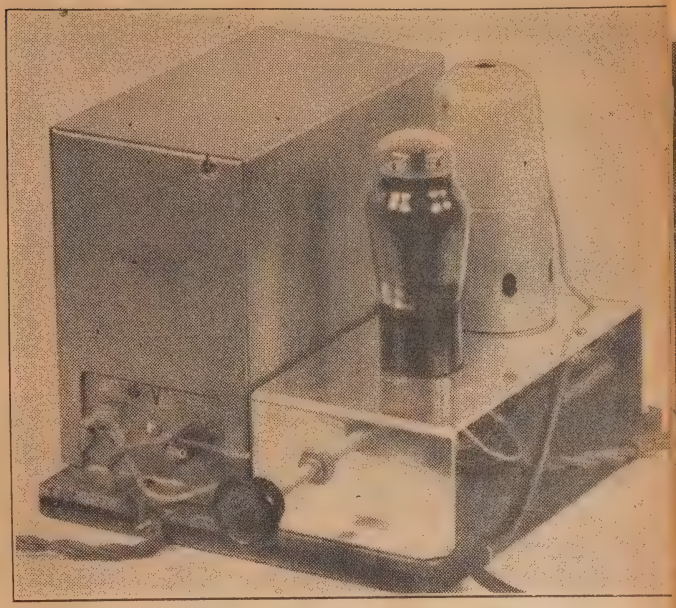
Most of the carbon microphones would be suitable for this job, should you have a suitable type on hand. Naturally, the full gain of the amplifier would not be required for such a mike, as the available output would probably be very much higher than the crystal.

If a carbon mike is used, it might be better to use a triode valve in the first stage, or to employ the 6J7G as a triode, in order to avoid having too much gain, which might be embarrassing to handle.

Although our pictures show the amplifier as a bare chassis and base-board, it is a very good plan to make a sturdy box to house the equipment. The speaker of course, will need a small cabinet of its own, and it should be free from damage if care is taken

The amplifier, however, will probably be placed in all kinds of odd corners in the course of its career, and should be well protected from someone's careless feet, for instance.

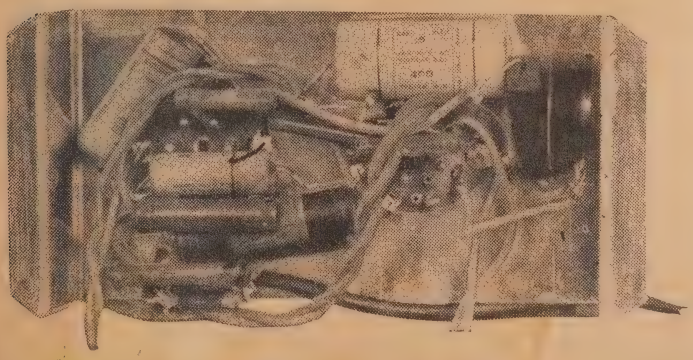
A good idea would be to make a box with a small compartment in which the microphone can be placed when not in use. When the lid is turned back or removed, only two controls need be seen—the volume control, and possibly a switch to break the A battery lead. While carrying the gear about, everything should be enclosed.



Here are the amplifier and power unit mounted on the one chassis to avoid damag in use, it is a good plan to house the whole in a sturdy wooden cabinet.

SPEAKER CABINET

The speaker cabinet can be closed in at the back, with a few holes about 1 inch in diameter drilled behind the speaker to relieve air pressure. A flap made of leather or some such material, could be made to cover the cone when not in use. A more substantial lid, of course, could be used if required, and it may be removed while the speaker is being used.



This under-chassis view gives an idea of the construction although this one is remarkable for its short leads rather than for its beauty!

Power Amplifiers

Write to RADIO HOUSE PTY. LTD. for particulars of the Vibrator Power Amplifier described in this issue. A complete price list of the parts required will be forwarded without obligation. Other lists of A.C. mains operated amplifiers can be had on request: the **Minor 4-valve priced at £12/10/-**, the **Major 5-valve at £16/10/-**, and the new **Major 6L6 25-watt type at £21/12/6.** Any of these can be had as a portable unit, housed in a leatherette covered carrying case with outside dimensions of 17in. x 17in. x 9in. Demonstrations can be arranged at the head office, 296 PITT STREET, or at our branch, 6 ROYAL ARCADE, SYDNEY.

KIT SETS

Write to us for complete detail price lists of the **Vibrator Power Amplifier, the All-Wave 6/40, 3-valve Portable, R. and H. Standard Six, and the 1939 Duplex Single.** These or any previous price list of a kit set published in "Radio and Hobbies" will be forwarded post free at your request.

Write to RADIO HOUSE PTY. LTD., 296 Pitt Street, Sydney, for all radio and electrical requirements.

RADIO HOUSE PTY. LTD.

296 PITT ST., SYDNEY.
6 ROYAL ARCADE, SYDNEY.

TRADE NEWS AND NEW RELEASES

LATEST PALEC V.T. VOLT METER

The new Palec V. T. Voltmeter. It is complete in a handsome crackle - finish cabinet complete with carrying handle. It is completely A.C. operated and cannot be damaged by overload.

A wide variety of uses will be found by servicemen for the recently-released Palec vacuum tube voltmeter illustrated. This instrument is of the peak reading diode rectification type, used in conjunction with a degenerative amplifier. This feature renders the calibration independent of variations in valve constants, due, for example, to ageing or replacement.

BRIEF specifications are as follows:—

Ranges: 0 to 2.5 volts r.m.s.; 0 to 10.0 volts, r.m.s.; 0 to 50.0 volts, r.m.s.

Scale Accuracy: This is within 2 per cent. over the range of 20 cycles to 50 megacycles.

Waveform Error: On complex waveforms, the voltage is .707 of the scale reading voltage, while on distorted waveforms, the calibration may be in error equal to the sum of the harmonic percentages.

Frequency Error: The instrument is non-reactive over the indicated frequency range, and is within 3 per cent.

Input Impedance: At 50 cycles the input impedance is approximately 5 megohms and becomes correspondingly lower as the frequency increases. From the voltage reduction point of view the input impedance at 50 cycles is 3.5 megohms.

Frequency Range: 20 cycles to 100 megacycles.

Input Capacity: The total input capacity across input terminals is 3.5 mmf.

Power Factor: Due to the use of Mycalex insulation for the input terminals and valve socket, the losses at high frequencies are mainly in the glass envelope of valve and across the resistances, with the result that the power factor at the high frequency end of the range is approximately 2 per cent.

Meter: The meter cannot be damaged by overloading the input circuit, irrespective of what range is being used.

Regulation: Changes in line voltages —10 per cent. does not affect the calibration or interfere with operation.

Zero Adjustment: Once the zero setting on the lower range is adjusted, no correction is then required in switching from one range to another.

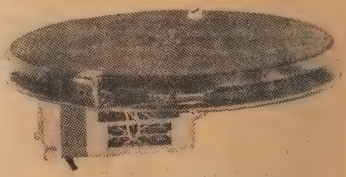
Power Consumption: The power consumption of the instrument is less than 7 watts, and due to the low currents, &c., used in amplifier, &c., the life of the valves is extremely long.

Complete data on this and other Palec instruments, including meters of all types, is available free on request from Paton Electrical Proprietary, Ltd., 90 Victoria-street, Ashfield, N.S.W.

De Launay Lands Collaro Motors

OWING to the interruption of regular supplies from overseas caused by war-time shipping delays, &c., Collaro Gramophone Motors, Amplion, and B.T.A. pick-ups have been very scarce on the Australian market of late.

However, Martin de Launay Pty., Ltd., advise that they have just landed large shipments of all three of these popular imported lines. This firm is particularly fortunate, as future supplies are likely to be, to say the least, spasmodic.



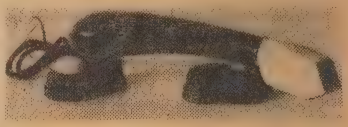
The Collaro Electric Motor

Martin de Launay Pty., Ltd., is on the corner of Clarence and Druitt streets, Sydney, and assure their customers of immediate delivery while supplies last.

Levenson's New Features

TO start the New Year, 1940, Levenson's Radio have a host of feature items on sale.

First.—The Crystal Cosmocord Pick-up for radio gramophone use. This unit is, indeed, a quality line. A short time ago a model of this type would have been too costly for the average radio user to obtain. In fact, a unit of this type was then to them a wild dream. However, the Cosmocord has changed matters completely, as the full outfit, including rest, sells at 48/6 at Levenson's. Full instructions as to connecting to any set and a template for hole positions on motor board are supplied with each unit.



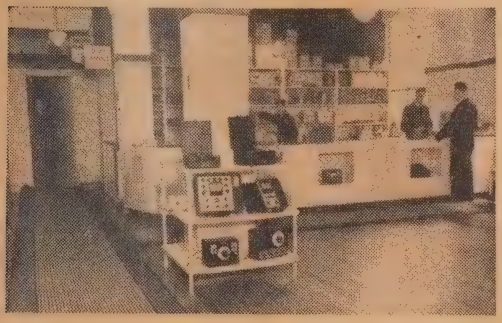
The Cosmocord Crystal Pick-up.

Second.—The Like-a-Flash, British-built microphone listed at 39/6. This low-priced unit gives 100 per cent. satisfaction. Another item in the microphone field is the batteryless hand-holding or hanging unit, which sells at 22/6.

RECONSTRUCTION AT RADIO EQUIPMENT

A view of section of the Radio Equipment offices. The company specialises in mail order work and the big office staff makes certain that orders receive same-day attention.

The Service Department and test equipment kits factory is completely modern in every detail. Here is a general view of the extensive layout.



Showroom and sales counter. Only half the display is shown here.

A big display of test equipment is a feature of the show-rooms.

NEW PREMISES NOW READY

Newly constructed premises allow Radio Equipment Pty. Ltd. to considerably enlarge their activities. Kitsets, and radio equipment of all kinds are now handled adequately by this firm. Special service facilities are also available.

ALL "Radio and Hobbies" readers know Radio Equipment Pty. Ltd., as the firm which has produced so many excellent pieces of test equipment for the home builder. In addition to test equipment, various items of radio interest produced by Radio Equipment have been described in "Radio and Hobbies" from time to time. This firm has just completed a reconstruction of its premises.

Radio Equipment Pty. Ltd. are specialists in test equipment, Radio and Hobbies kits of parts, amplifiers for guitars and other purposes, custom built and specially designed radio receivers, radio service work, and, indeed, anything appertaining to radio.

The reconstructed premises include a very extensive showroom, which houses a complete range of their own test equipment in addition to the well-known brands of Calstan and Palec.

On the second floor of their premises where the factory and laboratories are housed, additional benches, screen rooms, and a quantity of new test gear has been installed.

An interesting service made available to all "Radio and Hobbies" readers, is their offer of special rates for alignment and adjustment of radio receivers built from kits of parts supplied by them for Radio and Hobbies circuits.

Radio Equipment Pty. Ltd. make a point of one-day service. They specialise in mail order business.

Another very important free service offered by this company to their customers may obtain free technical consultation Service. Radio equipment customers is their free Technical Consultation upon any of their problems.

This is a firm which is progressing rapidly because it is giving its customers 100 per cent. co-operation and service. We will hear a lot from them in the coming year and Radio Equipment look forward to hearing a lot from "Radio and Hobbies" readers.

NEW PLANE KITS AT WALTHER AND STEVENSONS

WALTHER and STEVENSON, PTY LTD., of 391 to 395 George-stree Sydney, have just received from Ame ica the very latest in model airpla kits.

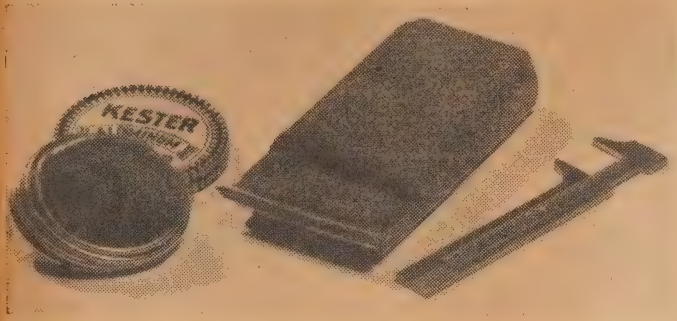
Modern in design, these kits are copi from originals that have proved thei selves as good machines on the flyi field. No previous experience is need in constructing one of these mode Every part is marked out to the exa size. All parts are supplied, such glue, covering, dressing, &c. The pl and instructions included in the make building a very simple proce

Kits are available in many differe models all new and interesting. Pric range from 1s 9d for the small mod to 45s for the larger models. All a complete in a box so that the pa will not be damaged.

Model plane flying is becoming mo and more popular every day. Be the fashion by building your own mod and make it fly.

BETTER W'SHOP EFFICIENCY

WITH THESE AIDS FROM NOCK & KIRBY



Here is shown a tin of Kester solder, the Karsten scraper, and the Pocket Slide Calipers.

Here are three very useful lines:—

1. Kester Aluminium Solder.—The adio workman using Kester will suceed where others using ordinary solder vill fail. Radio work calls for aluminium oldering and the ease with which Kester" does the job is really remarkble.

The tin, containing one reel of flux ored solder, steel wool for cleansing urposes and complete directions for use, osts only 1/3.

2. Karsten Scraper.—Used by all the arge painting contractors, wood olishers, &c., these high-grade tools re just the thing for any job calling or a high-grade scraper.

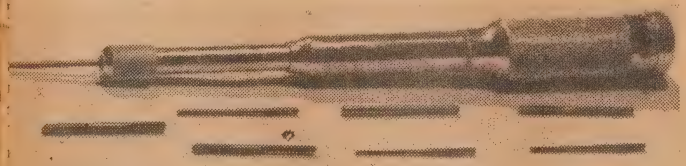
They are very economical as the blade, hich is detachable, may be sharpened gain and again. New scraping hooks blades) may be purchased separate at very small cost, so the Karsten scraper iterally lasts a lifetime.

Many different models can be obtained to suit each special job. Prices vary with the size of scraper.

3. Pocket Slide Calipers.—Graduations on the smooth brass slide are clearly etched in 1-32in. and M/M. A small bulge on slide makes it easy to open or close with one hand. Very handy for any workshop, this tool sells at 2/6.

The "Mr. Punch" automatic drill is a comparatively new line in the stock of Nock and Kirby Ltd. Many features are included in this model. The finely knurled handle is of the magazine type, having individual compartments for the eight different size drill points. These compartments are numbered and below the number is a gauge showing the size of hole drilled by the point in that compartment. Only one compartment opens at a time.

The tool is highly polished and eight fluted shank drill points, 1-16 to 11-64ths inch in diameter, is included in the regular equipment.



"Mr. Punch" automatic drill set.

A. G. DAVIS—MAIL ORDER SPECIALIST

MIE beginning of "Radio and Hobbies" has certainly boosted the itset trade of many of Sydney's well-nown radio retailers. Mr. Davis, head the A. G. Davis Radio Co., has inormed us of the many new fields in adio that our paper has introduced.

The trained staff employed to attend mail orders gives service that is hard equal, and all inquiries are answered omptly and in a manner as to leave the customer in a complete knowledge of prices, quality, &c.

A full range of all standard radio receivers is kept in stock and demonstrations can be arranged so as to let the receiver "sell itself."

Situated on the first floor, Wembley House, Railway-square, the Davis Radio Co. assures all purchasers of the "Radio and Hobbies" circuit kitsets of the utmost co-operation during the assembling period.

SERVICE SUPREME

INTENDING "Radio and Hobbies" kit set constructors may with confidence place their requirements in the hands of John Martin, Pty., Ltd., where an experienced and highly trained staff of kit set specialists have full-time jobs assembling orders from the length and breadth of the Commonwealth. Friendly service and personal attention has reaped its reward in phenomenal kit set sales and letters of appreciation from more-than-satisfied clients.

John Martin Pty., have considered carefully every problem confronting the home constructor and details such as correct color codes, necessary hard-

Careful packing is a feature of John Martin's service.

ware, insulating washers, and other incidentals which would normally hold up assembly have been especially noted. Special attention has been paid to chassis supplied, care being taken to ensure that the components fit snugly and that no extra drilling or cutting is required.

Close co-operation between Radio and Hobbies, the parts manufacturers and "The Friendly Wholesaler" makes possible immediate delivery at all times.

Write or call at John Martin, Pty., Ltd., 116-118 Clarence-street Sydney, for lines of interest to the trade and to general radio enthusiasts.

Great care is taken to see that all parts reach you undamaged.

SPECIAL TRAINING AT MARCONI SCHOOL

So great has become the demand for wireless operators in recent months, that the Marconi School of Wireless is intensifying the training of its students with a view to producing qualified radio men in considerably reduced space of time.

Hitherto the preliminary training of wireless operators at the Marconi School in Sydney has been carried out by correspondence. This method has been very successful, but for the benefit of those who wish to complete the course as rapidly as possible, personal tuition is now being given from the very beginning.

NEW COURSES

Two new courses are being initiated, both of which have been approved by the Australian Air Board. The first is for the benefit of young men who wish to join the Royal Australian Air Force as radio operators but whose knowledge of wireless is below the requisite entry standard. This course, which involves instruction in elementary electrical and radio theory and practice in the Morse code, may be completed in three months, during which period the student, if necessary, will also acquire a grounding in elementary mathematics.

FOR CIVILIANS

The second course is intended for men who desire to obtain appointments as civilian wireless instructors. This course is an intensified refresher training and is suitable only for those who have had previous experience in radio and electricity, but require a "polish-up" to bring their knowledge right up to date.

NOVEL SPEAKER DESIGN

1940 AMPLION RANGE

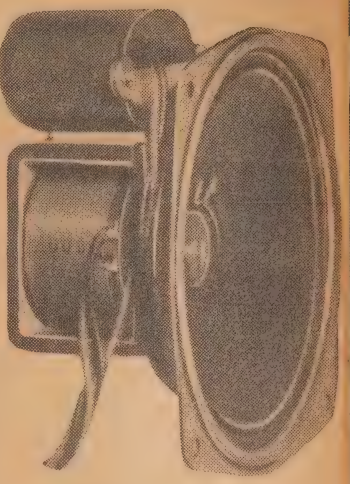
NEW 5in. and 7in. Amplion speakers have many new features which make them distinctive. The usual circular face has been displaced by an almost square appearance; the mounting holes have been removed from the cone edge and placed outside the cone diameter, thus effectively increasing the active cone area. In the 5in. model the cone has been increased in area by 30 per cent., and the 7in. cone is as large as some 8in. speakers.

Field coils have also been increased in copper weight so that efficiency is progressively extended. The 5in. will handle 3 watts undistorted and 5 watts maximum; the 7in. will take care of 8 watts undistorted and 12 watts maximum.

Special transformers, insulated from the case and with B positive connected to the core stack, are fitted to all 1940 Amplion speakers. Amplion claims that their 5in. is the only speaker of similar size fitted with genuine impregnated and fully sealed transformer in a one-piece case.

Cones of one-piece moulded fibre are specially treated against humidity effects and shaded in mass from the apex to the periphery, providing perfect reproduction from the highest frequency down to below 60 cycles per second.

Electric welding of the cone housing, pole plates and yoke ensures a perfect magnetic circuit. Complete dustproofing and concentric spiders are a feature of the latest Amplion patents. Electro-magnet and permag types are available from stock at new low stabilised prices, and a new illustrated folder is available on application to Amplion, Ltd.



One of the new Amplion speakers.

Price's Annual Sale

THE sale that all keen radio buyers have been waiting for is now on Price's Radio have commenced their annual summer sale.

"Better Bargains Than Ever" is their policy for this year, and it is well borne out by a visit to their store, which is packed with all radio requisites. Nearly every article has been reduced, not from present retail prices, but from those ruling before the war. You should take full advantage of this sale as all prices are advancing rapidly, and most imported lines will be unprocurable in the near future.

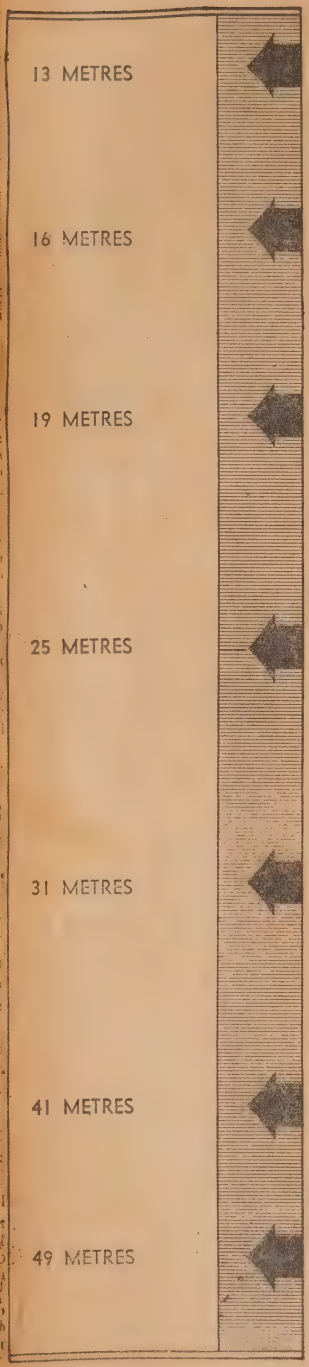
A complete kit set for the new Duplex Single, featured in the Christmas issue, and made available at Invincible Radio. Everything is included.

BURGLARS AND KITSETS AT INVINCIBLE RADIO

THE well-known Radio and Hobbies kitset specialists, Invincible Radio Pty., Ltd., of 102 Clarence-street Sydney, have been visited twice within the last five months by window smashers. At both the times mentioned, various Radio and Hobbies kit sets were on display in the window.

Mr. Norm Cohen, popular manager of Invincible, says that the components must be 100 per cent. especially as the marauders paid a second visit. With this as proof, there can be no denying that the home constructor is in all walks of life.

S. W. TUNING CHART



13 METRES

GSJ. 13.93m. Daventry. 8.42 p.m. onwards.
GSH. 13.97m. Daventry. 8.42 p.m. onwards.

16 METRES

GSV. 16.85m. Daventry. 8.42 p.m. onwards.
GSG. 16.86m. Daventry. 8.42 p.m. onwards.
DJH. 16.82 Berlin. 8.0 p.m. onwards.
TPB3. 16.88m. Paris. 8.0 p.m. onwards.
2RO8. 16.84m. Rome. Good at 11.0 p.m.

19 METRES

GSF. 19.82m. Daventry. Good at 7.0 p.m.
DJR. 19.56m. Berlin. Good at midnight.
PCJ2. 19.71m. Huizen. Good at 11.0 p.m.

25 METRES

VLQ2. 25.27m. Sydney. Excellent in the evening.
GSD. 25.53m. Daventry. Good 7.0 p.m. and 11.0 p.m.
WCBX. 25.36m. New York. Good from 7.0 a.m.
Saigon. 25.47m. Saigon. Excellent from 9.0 p.m.
WRUL. 25.45m. Boston. Good at 7.0 a.m.
VLW3. 25.36m. Perth. Fair strength in daytime.
XGOY. 25.21m. Szechwan. Good from 9.0 p.m.

31 METRES

VLQ. 31.21m. Sydney. Excellent at 6.0 p.m.
VLW2. 31.08m. Perth. Good at 8.0 a.m.
GSB. 31.55m. Daventry. Excellent at midnight.
GSC. 31.32m. Daventry. Good at 7.0 a.m.
DJA. 31.38m. Berlin. Excellent at midnight.
CSW7. 30.80m. Lisbon. Very good at 7.15 a.m.
KZRH. 31.13m. Manila. Very good from 8.0 p.m.
2RO3. 31.15m. Rome. Very good at 7.0 a.m.

41 METRES

JVW. 41.34m. Tokio. Fair at 6.30 a.m.
JIE. 41.13m. Tyureki. Fair at 1.0 a.m.

49 METRES

GSA. 49.56m. Daventry. Now quite good at 7.0 p.m.
——. 49.54m. Rangoon. Very good at midnight.
KZEG. 48.86m. Manila. Always good at night.
MTCY. 48.98m. Hsinking. Good every night.
VQ7LO. 49.32 m. Nairobi. Good at 5.0 p.m.
RV96. 49.75m. Moscow. Very loud at midnight.

OVERSEAS BROADCASTERS

ENGLAND.—Despite the natural preponderance of news bulletins from the Empire stations, they still find time to give us a great number of really enjoyable musical programmes. In addition to these, there are actuality broadcasts, covering the many phases of the war, such as the arrival of the Dominion troops, etc. Both in the morning, late afternoon, and at night, the various transmitters are heard at very good strength.

FRANCE.—The short-wave stations of our French allies can be heard at quite good strength both on the 25-metre band in the morning, and also on the 16-metre band at night. Frequent news bulletins are given as shown in the station lists.

U.S.A.—While some of the United States stations which were formerly heard at good strength are now not of any entertainment value, very good reception can be had both from WCBX in New York on the 25-metre band around 7.0 a.m., and also from WRUW and WRUL in Boston, round about the same time. These latter stations give some very interesting and instructive talks, which are very popular both in the United States and overseas countries.

BURMA.—With the inauguration of the powerful new transmitter in Rangoon, mentioned in our other article, this outpost of Empire now has the opportunity of giving its views on the war, and also at the same time give its many listeners some really good musical programmes by means of its very extensive record library.

SWEDEN.—Despite the unsettled condition of this Scandinavian country due to the threats of aggression from nearby countries, a very enjoyable programme can still be heard on a Sunday night from 6.0 p.m., when their 25-metre band station, SBP, puts in quite a good signal. This one can easily be found, as it is the highest wave-length station on the air at that time, and announces in English just before opening.

THAILAND.—As a change from the normal European type programme, a pleasant half-hour may be spent listening to HSP6 in Bangkok, which opens at 11.0 p.m. on 37.65m. Announcements are given in English, and quite often the studio orchestra give their interpretation of some well-known tunes. News bulletins in English can also be heard at various times.

TURKEY.—For those listeners who enjoy hearing the latest dance tunes by some of the leading orchestras, we would suggest listening to TAP in Ankara, any morning from around 6.30 a.m., when they will hear all the popular tunes, and also many which have so far not reached Australia. This same station can also be heard at night, as shown in our last issue.

RAY SIMPSON'S PAGES

SUNSPOTS AND RECEPTION

FINN STATION DESTROYED

While on the whole receiving conditions have been rather good since the beginning of the year, about the middle of January reception on the higher frequencies was affected to a marked extent by sunspot activity.

WHILE this solar interference did not completely eliminate signals, as has been the case on some previous occasions, it fluttering on the majority of stations, making enjoyable reception impossible.

DEPT. OF INFORMATION BROADCASTS

Great interest has been caused in short-wave listening circles by the inauguration of the new stations conducted by the Department of Information for the purpose of giving listeners in foreign countries Australia's views on the war, and also to provide topical talks dealing with the attractions and industries of the Commonwealth.

Providing these broadcasts are heard well overseas, they should do much to counteract enemy propaganda, and at the same time pave the way for a greater interest in Australia as a tourist resort at the conclusion of the war.

FINNISH STATION DESTROYED

We learn from the daily Press that the Finnish radio station at Lahti has been destroyed during one of the air raids on that town. While the Finnish stations have never been heard at any great strength in this country, listeners will regret the passing of yet another of the European transmitters.

Let us hope that in the near future the Finnish authorities will again be transmitting on their assigned channels.

DX COMPETITION

In our next issue we hope to announce details of a reception competition which should appeal to many of our listeners. At the present time we are drawing up the rules, which we hope should give both the novice and the experienced listener an equal chance in winning the th prize. While nothing definite has as yet been decided as to the exact form the competition will take, we will drop a hint and advise all intending competitors to pay particular attention to the Central and South American stations.

Will all listeners who are kind enough to send us their monthly reports please let us have them by Monday, February 12, to ensure inclusion in next month's issue?

LISTENING on NEW YEAR'S DAY

IF readers followed our advice and tuned over the various bands in the late afternoon of January 1, they were amply repaid by the number of stations on the air, which are not normally audible at that time of the day.

Only one station not previously logged was heard at our location, but it was quite an interesting one, being HP5F, "The Voice of Colon," located in Colon, Panama. They were operating on 6040kc., 49.67m., and were on the air until 6.50 p.m., when they closed with selection from "Rose Marie."

Also on the 49-metre band was TILS, WCBX, WPIT, and the well-known Cincinnati station, WLWO.

MANY CUBANS

The many Cuban stations were also operating until late in the afternoon, and around 4.30 p.m. we heard COBC, COCH, COBZ, COCX, COCQ, COCA, and COCO. In addition to these, the many Americans were also having a very gay time judging from the cheers and laughter to be heard from the different stations.

Amongst the best of these was KGEI, who were coming in very well at 6.0 p.m., which was midnight on New Year's Eve in San Francisco.

Altogether a pleasant couple of hours was spent listening to people in other countries, as people in Australia were recovering from their own celebrations a few hours previously.

TYPHOON SWEEPS GUAM

DURING the past month a severe typhoon swept the island of Guam, which is one of the United States naval outposts in the Pacific Ocean.

It was especially severe at Agana, and brought down all the telephone wires, necessitating all communications to be handled by the Naval Radio Station, NPN. One of our readers, Mr. R. K. Clack, was fortunate in hearing this station in operation while the typhoon was raging.

SHORT-WAVES

AUSTRALIA BROADCASTS!

OUR own short-wave stations have not been without interest during the last few weeks, as some quite interesting changes and additions have taken place.

First of all, the new overseas stations, VLQ on 9615 kc. and VLQ2 on 11,870kc., are being heard at excellent strength throughout the Commonwealth, and also we understand in overseas countries.

In addition to these now regular stations, we have heard another of these Department of Information stations, namely, VLQ5, which was operating on 9590kc., transmitting the Prime Minister's speech for reception in North America.

31-METRE INTERFERENCE

There has unfortunately been a certain amount of interference with the two 31-metre stations, TIPG being troublesome to VLQ from 10.0 p.m. onwards, while the Indian, VUD2, also interfered with VLQ5 when that station was on the air.

The German station, DXB, which is assigned to 9610kc., only 5kc. away from VLQ, might also interfere with the latter station, but as they are not usually on the air at the same time, this trouble may not eventuate, and even if it does the German authorities would not be particularly interested, more especially as they were using DXB before VLQ opened on the nearby channel.

PERTH ON 9650kc.

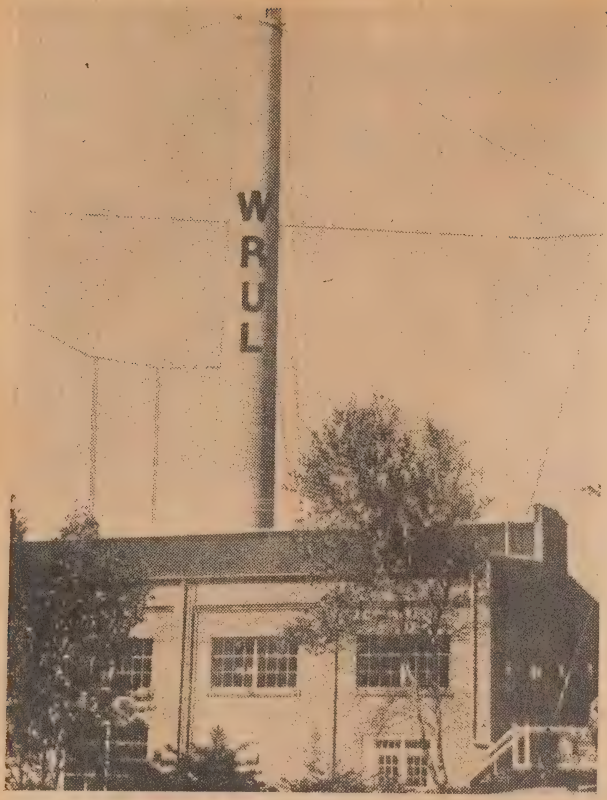
On January 12 we heard VLW2, Perth, working on a new frequency of 9650kc., 31.08m., in a special transmission directed to South Africa. At 6.30 a.m., when we first heard it, the strength was very weak, but on closing at 8.0 a.m. was quite good speaker.

Reports were asked for from South Africa as to whether this new frequency and beam was any better than VLW3 with its beam to the N.W. of Australia. It would appear from the above that VLW2 has discarded their 9560kc. channel, probably due to the interference experienced from DJA.

CHANGE FOR VLR3

Another change in frequency is VLR3, which has always operated on 11,880kc., 25.25m., but has now changed to 11,850 kc., 25.32m. The reason for this change is hard to follow, as on 11,880kc. they were 5kc. away from Paris, while on 11,850kc. they are only 5kc. from DJP and 7kc. from the new Paris station.

We have just been advised by the A.B.C. that this new frequency of 11,850kc. is only a temporary one, so, of course, it may have been discontinued in favor of another before these notes are in print, but this is the position at time of writing.



THE SHORT-WAVE VOICE OF BOSTON

This is the transmitter and aerial system of WRUL, Boston, which broadcasts to the world on 5 different beams.

THIS MONTH'S VERIFIED STATIONS

We have received the following verification from stations logged during the past few months. Stations so verified are listed in these columns each month.

PRA8.—6010kc., 49.92m., Pernambuco, Brazil. The Radio Club of Pernambuco sent a very attractive card in blue and white showing a radio mast and beacon. They ask for further reports and give address as Av. Cruz Cabuga 394, Pernambuco, Brazil, South America.

ZRL.—9606kc., 31.23m., Capetown. The usual yellow card was received from this station, verifying reception at 3.0 p.m. Eastern Australian Standard Time, which is a very unusual time to hear any South African station. The address is South African Broadcasting Corporation, P.O. Box 4559, G.P.O., Johannesburg, South Africa.

WRUW.—15,130kc., 19.83m., Boston, Mass. The World Wide Broadcasting Foundation sent along their usual blue and white card verifying reception on this frequency They invite listeners to become members of the World Wide Listeners' League, and will send leaflet on request. Our report was their first from Australia for this frequency.

WGEA.—9550kc., 31.41m., Schenectady, N.Y. The usual General Electric cards showing map of the world were received from this station, and also from WGEA on 15,330kc. and WGEO on 9530kc. All cards from these stations are impressed with a hand stamp when reception is verified. Without the hand stamp they are not verifications.

WBOS.—9570kc., 31.35m., Boston, Mass. The Westinghouse people sent a letter of verification, advising that their transmissions are beamed on South Africa, with a double-ended beam. There has been some thought of changing the direction of the beam, but no decision has yet been made.

More Transmitters In South Africa

Last month we reported reception of a new South African station on 11,770kc., 23.49m., located in Durban, but at that time we were unable to give the call letters.

Advice has just been received from the S.A. Broadcasting Corporation that this new station is ZTE, though they give the frequency as 11,800kc., 25.42m. At the time we heard it, it was definitely on 11,770kc., in between 2RO15 and Radio Saigon, who were on at the same time.

As we have not heard it since, perhaps it is now on its correct frequency. This new station uses 300 watts power, and is on the air between midnight and 2.15 p.m. with the same programme as ZRO on 9755kc., 30.75m.

In addition to ZTE, other new stations are as follows:—Johannesburg, ZRI, 4954.67kc., 60.55m., and ZTJ, 9909.34 kc., 30.28m. Both these stations are on a power of 200 watts. There is also another Capetown station on 6000kc., 50.0m., being used experimentally with a power of 300 watts. No call letters are given for this latter station.

PROGRAMME NOTICE

The South African authorities also give the following interesting information:—The short-wave stations at Pretoria and Johannesburg relay Johannesburg's programmes, while Pietermaritzburg and Durban short-wave stations relay Durban. The call signs are never broadcast, but the opening and closing announcements of the stations give the name of the towns where the transmitters are located, with the exception of the early morning call (4.45 G.M.T.), which is "Johannesburg calling South Africa" on all stations.

As stated previously, the best time for reception of these South African stations is in the early hours of the morning from around 1.0 a.m. till about 2.15 a.m., while they can also be heard on the 49-metre band between 6.0 a.m. and 7.0 a.m.

STATION ADDRESSES

XEXA.—"Radiodifusora XEXA," Departmento Autonomo de Prena y Publicidad, Mexico City, Mexico.

CB960.—Onda Corta Estacion CB960, P.O. Box 1B, Santiago, Chile.

COGF.—Onda Corta Estacion COGF, Gen. Betancourt 51, Matanzas, Cuba.

PSH.—Onda Corta Estacion PSH, P.O. Box 709, Rio de Janeiro, Brazil.

NEW STATIONS FOR 1940

MOZAMBIQUE—BURMA—COLOMBIA

If the first few weeks of January are any criterion, listeners will have a busy time in keeping check on the new stations which may come on the air during the rest of the year. Unless some more effective form of control is brought into force, we fear that the various recognised short-wave broadcast bands will soon become so congested, as to preclude enjoyable reception, except under very favorable conditions.

All listeners are acquainted with the well-known CR7AA and CR7BH stations located in Lourenco Marques, Mozambique, and they now have the opportunity of logging another transmitter controlled by the same organisation.

The new one is CR7BE on 9640kc., 31.12m., which opens every morning at 5.0 a.m. at good strength. Both male and female announcers are in charge, and the lady gives the call letters, frequency, etc., in English at various intervals. The first morning we heard this one, quite a large portion of the programme was in our own tongue.

According to the announcements, this session is intended for Europe. News in English is given at 6.50 a.m., and they close with the Portuguese National Anthem at 7.0 a.m. Just before closing, the lady requests reports, which are to be sent to P.O., Box 594, in Lourenco Marques, Mozambique, Port. East Africa.

RANGOON EXTENDS

On January 2 we heard for the first time a powerful new station in Rangoon operating in the 49-metre band on 6056kc., which is equal to 49.54m. This station operates in parallel with XYZ on 6007kc., but is very much more powerful. In the announcements they give the wave-length as 49.54 and 86 metres. No call letters are given, but we may have these in time for inclusion in the stop press panel; if not, they will be given in next month's issue.

Watch out for another Rangoon station on 9590kc., 31.28m., as we understand this frequency will be used shortly.

ANOTHER 31M. COLOMBIAN

The latest addition to the already overcrowded 31-metre band is a Colombian station on 9570kc., 31.35m., which is on the air every morning from around 6.0 a.m. Unfortunately, it is badly heterodyned by WBOS on the same frequency, which makes reception very difficult.

The only definite details we have at present are that it is called "La Vox de la Victor," and that it is in Colombia. At each quarter-hour three chimes are given, followed by the call letters, etc., but so far we have been unable to determine what they are, beyond that they commence with HJ.

The only Colombian station we know of that uses the slogan "La Vox de la Victor," is the old HJ3ABH, later HJ3CAH, and now known as HJCH. This station is located in Bogota, but has been using the new 62-metre band, but, of course, may have changed down to the 31-metre one. On one morning we heard a call given which sounded very like HJAB, which, if correct, would place the station in Barranquilla, but we hope to be able to give definite correct call next month.

CHINESE ON 30.47m.

During the latter part of December and early in January, a new Chinese station was heard on 9840kc., 30.47m., which opened at 10.0 p.m. nightly, with the call, "XGSE short-wave station, located in China, operating on 9840kc., 30.47m."

We never heard any town mentioned, but merely the fact that it was located in China, which is not very helpful if one wished to write to it. Strength was fairly good, but quality poor, as is often the case with Chinese stations. At the time of writing, they appear to have left the air, or moved to another channel which we have not so far located.

STOP PRESS

"RADIO CZECHOSLOVENSKO"

A NEW Czechoslovakian station has been heard working on 9565kc., 31.6m. at various times from 4.0 a.m. No announcements in English have been heard, but the call "Radio Czecho-Slovensko," is given at intervals. Both music and talks are heard, and this station seems to close down for about twenty minutes or so every hour and then come on the air again. A news bulletin in Czech is given at 7.15 a.m.

* * *

ZTE DURBAN VERIFIED

JUST as we go to press we have received a verification card for the new Durban station ZTE, an article on which appears on another page. In an accompanying letter, the chief engineer advised us that ours was the first reception report they had received from Australia on this new 25-metre band station, which had only been on the air about two months at time of writing.

FLASHES FROM EVERYWHERE

BRAZIL

A powerful new short-wave station is being built in Rio de Janeiro, and when completed will operate with 20 kw. on 17,835kc., 15,370kc., 11,890kc., 11,825kc., 11,710kc., 9600kc., 9585kc., 9505kc., and 6200kc. (Globe Circler.)

DENMARK

The Danish authorities will shortly take into use the following new transmitters: OZ12, 17,810kc.; OZ13, 17,835kc.; OXY2, 6170kc.; OXY3, 6045kc. We learn the above through the IDA.

SPAIN

There will shortly be another short-wave station in Madrid which will operate on various frequencies with a power of 40kw.

CHILE

The well-known Chilean station, CD1190, located in Valdivia, is now using beam antennas, and is very anxious to hear of any improvement in signal strength. There is now a session from 7.0 a.m. till 10.0 a.m.

GREECE

Another new country to the short-wave bands is Greece, which will soon have a station at Sparta operating under the following calls and frequencies:—SVD, 6885kc.; SVL, 7228kc.; SVG, 7805kc.; SVH, 9030kc.; SVI, 9695kc.; SVJ, 9825 kc.; SVM, 9935kc.; SVN, 10,705kc; SVP, 12,195kc.; SVQ, 13,640kc.; SVT, 15,015kc. (Globe Circler.)

EGYPT

The Egyptian State Broadcasting are testing a short-wave transmitter located at Cairo, the power being 500 watts. The frequencies used so far have been 6010kc. and 11,780kc., but possibly there are others. (Globe Circler.)

CANADA

When the new Government short-wave station takes the air it will use the following frequencies:—6060kc. 6160kc., 9630kc., 11,705kc., 15,190kc., 17,810kc., 21,710kc., and 25,620kc.

TANGIER

According to the IDA the French authorities have opened a short-wave station in the International Zone in Tangier, which is operating on both phone and CW with a power of 2kw. under the call of CNW2 on a frequency of 5884kc.

HSP6 REPLACES HS8PJ

AS reported briefly in the stop press panel last month, the well-known stations, HS6PJ and HS8PJ, have been replaced by HSP6 on 7968kc., 37.65m.

This is a clear channel, and when it opens at 11.0 p.m. is quite strong. The opening announcement is in English, when details of the night's programme is given.

In the announcement we heard it was stated that HS6PJ and HS8PJ would no longer be used, and that in future HSP6 would be the only frequency used by this Thailand station. On opening at 11.0 p.m. the chimes of 8.0 p.m. are heard, followed by station announcement.

Listen for these!

OVERSEAS STATIONS NOW AUDIBLE

Here is a list of short-wave stations which have actually been heard over the last few weeks. Most of these should be heard by any of our short-wave fans who have a good set and location. Details of each station are given, and when also reported by readers, their names appear in brackets.

ENGLAND

GSA.—6050kc., 49.56m., Daventry. Now being heard at the unusual hour of 7.0 p.m. (Battis, Medina, K.Mc. Foster, Lee, Clack).

GSB.—9510kc., 31.55m. Only fair in the late afternoon, but at midnight comes in at great strength. (Gaden, Lee, Medina, Foster, Clack, K.Mc.).

GSC.—9580kc., 31.32m. This one can be heard at good strength at 6.50 a.m. with news. (Gaden, Medina, Lee, K.Mc., Foster).

GSD.—11,750kc., 25.53m. By 7.0 p.m. this station is good strength, and is also good at 11.0 p.m. (Battis, Gaden, K.Mc., Foster, Medina, Clack).

GSE.—11,860kc., 25.29m. Quite good at 7.0 p.m., but very much better after midnight. (Gaden, Medina, Battis, Foster, Clack).

GSF.—15,140kc., 19.82m. Only fair in the mornings, but good in news session at 7.0 p.m. (Foster, Gaden, K.Mc., Lee, Medina, Clack).

GSG.—17,790kc., 16.86m. Heard at good strength at night, but not as strong as last month. (Lee, Gaden, Medina, Foster).

GSH.—21,470kc., 13.97m. Now only heard very weakly in the night session from 8.42 p.m. (Lee, Silverthorne, Gaden).

GSI.—15,260kc., 19.66m. This station is only fair in late afternoon, but fairly good by 8.0 p.m. (Medina, Gaden, Foster, K.Mc., Lee, Clack).

GSJ.—21,530kc., 13.93m. Still good till about 10.30 p.m., after which it quickly weakens. (Silverthorne, Lee, Gaden).

GSO.—15,180kc., 19.76m. Has weakened very considerably from what it used to be. (Medina, Gaden, Clack).

GSP.—15,310kc., 19.6m. Only fair strength in the mornings, but much better about 7.0 p.m. (Foster, K.Mc., Lee, Gaden, Medina, Clack).

GST.—21,550kc., 13.92m. Only heard occasionally, and is always very weak. (Gaden, Lee, Silverthorne).

GSV.—17,810kc., 16.85m. Comes in very well every night in the session opening at 8.42 p.m. (Battis, Gaden, Lee, Medina).

GSW.—7230kc., 41.49m. On some occasions has been heard quite well at 5.0 p.m. (Medina, Clack).

GSL.—6110kc., 49.1m. In the very early mornings from about 5.30 a.m. comes in at good strength.

GRX.—9690kc., 30.96m. Can easily be followed both in the early morning and also at 6.0 p.m. (Clack).

AUSTRALIA and OCEANIA

VLQ.—9615kc., 31.21m., Sydney. The new overseas short wave station, conducted by the Department of Information, is being heard at good strength in the Sydney area. (Lee, Cox, K.Mc., Clack, Foster.)

VLQ2.—11,870kc., 25.27m., Sydney. This other outlet of the same station is also being heard at great strength. (Cox, Clack.)

VLQ5.—9590kc., 31.28m., Sydney. This one is also a very loud station when it is on the air late at night. (Clack.)

VLR.—9580kc., 31.32m., Lyndhurst. Still being heard at good strength in Sydney, also other locations. (Lee, Foster, Gaden, Battis, Medina, Clack.)

VLR3.—11,850kc., 25.32m., same location. The 25 metre outlet of the Lyndhurst station also comes in very well. This new frequency is only temporary, according to advice received from the A.B.C. (Lee, Foster, Gaden, Medina, Battis, Clack.)

VLW.—6130kc., 48.94m., Perth. When this frequency was in use it was heard at good strength. (Hallett, Richards, Lee, K.Mc., Battis.)

VLW2.—9650kc., 31.08m., same location. Heard this one in special session for South Africa between 6.30 a.m. and 8 a.m., also excellent at night from around 9 p.m. (Lee, Battis.)

VLW3.—11,830kc., 25.36m., same location. A very good signal is heard from this one both in day time and at night. (Lee, K.Mc., Foster, Clack, Gaden.)

FK8AA.—6122kc., 49.0m., Noumea, New Caledonia. This station is now only being heard at weak strength at most locations. (Lee, Foster, Medina, Battis.)

VPD2.—9535kc., 31.47m., Suva, Fiji. This station is again on the air at night at good strength, but now closes down at 8 p.m. Heard first time since war started on January 16.

ITALY

2RO3.—9630kc., 31.15m., Rome. Always a good signal both in the mornings and also between 4 p.m. and 5.30 p.m. (Gaden, Battis, Clack, Hallett, Silverthorne, Richard, Lee, K.Mc., Foster, Medina.)

2RO4.—11,810kc., 25.4m. This one is good till about 6.30 a.m., also at 8 p.m., and best of all at 2 a.m. (Gaden, Battis, Medina, Clack, Hallett, Silverthorne, Lee, K.Mc., Foster.)

2RO5.—15,170kc., 19.78m. Only heard occasionally and usually from 7.15 p.m. till 8 p.m.

2RO6.—15.300kc., 19.61m. Heard well between 7 p.m. and 7.30 p.m., and also at fair strength in mornings at 7 a.m. (Gaden, Medina, Foster.)

2RO8.—17,820kc., 16.84m. Has improved very much in their night session, also weak in the forenoons. (Gaden, Battis, Medina, Lee, Silverthorne, Foster.)

2RO9.—9667kc., 31.03m. Only heard in the mornings, and not as strong as 2RO3. (Medina, Silverthorne.)

2RO12.—15.100kc., 19.87m. This one is now only heard occasionally between 8 a.m. and 8.30 a.m.

2RO14.—15,230kc., 19.7m. Very hard to separate this one from Paris at night, but heard best between 10 p.m. and 11 p.m.

2RO15.—11,760kc., 25.51m. Improved very much since first heard and quite good level at 11 p.m., better still at 2 a.m.

IQA.—14.795kc., 20.28m. The Arabic programme from this station is heard nightly from 7.30 p.m. till 7.55 p.m. (Richard.)

IRF.—9830kc., 30.52m. Very good strength in early morning until closing at 5.30 a.m.

IQY.—11.673kc., 25.74. This station can also be heard at same time as IRF, but not as strong.

AS readers will remember the new Swiss station at Schwarzenburg was burnt just after it was completed last July. The station has now been rebuilt, and will shortly commence testing on various frequencies, possibly 9535kc. and 11,867kc., which are two of their assigned frequencies.

NORTH AMERICA

WPIT.—21,540kc., 13.93m., Pittsburg, Pa. This one only reported by Dr. Gaden from Queensland.

WPIT.—15,210kc., 19.72m. Same location. Comes in nicely every night from around midnight.

WPIT.—11,870kc., 25.27m., same location. In the mornings at 7.0 a.m. is one of the best on the 25-metre band. (Hallett, K.Mc., Silverthorne, Clack, Lee, Foster, Medina, Gaden).

WLWO.—6060kc., 49.5m., Cincinnati, Ohio. Only heard weakly in the late afternoon. (Foster).

WCAB.—15,270kc., 19.64m., Philadelphia, Pa. Heard in the early morning around 7.0 a.m. (Foster).

WCAB.—9590kc., 31.28m., same location. This station is not as strong as previously, but news can be followed at 4.55 p.m. (Gaden, K.Mc., Foster, Medina).

WRUW.—15,130kc., 19.83m., Boston, Mass. Comes in nicely between 6.0 a.m. and 7.0 a.m. (Foster, Gaden, Medina, Clack).

WRUW.—11,730kc., 25.58m., same location. On some mornings puts in an excellent signal till just before 8.0 a.m. (Foster, Gaden, K.Mc., Clack).

WRUL.—11,790kc., 25.45m., same location. This station is the more regular of the two on this band at the same time as WRUW. (Clack, Silverthorne, Foster, Medina, Gaden, K.Mc., Hallett).

WBOS.—9570kc., 31.35m., same location. Still being heard in the late afternoon, with news at 4.55 p.m. Now very weak. (Gaden).

WNBI.—17,780kc., 16.87m., New York, N.Y. One of the few stations now heard in daytime. News at 1.0 p.m. (Silverthorne, Lee, Gaden, Foster, Medina).

WRCA.—9670kc., 31.03m., same location. On Sunday afternoon now on the air till 5.0 p.m., and heard quite well at that time. (Medina, K.Mc.).

WCBX.—21,570kc., 13.91m., same location. Very weak at 11.0 p.m., but by 2.0 a.m. is quite a good station. (Silverthorne, Gaden).

WCBX.—15,270kc., 19.64m., same location. Only weak now in the morning till it closes at 6.30 a.m. (Gaden, Medina, Foster).

WCBX.—11,830kc., 25.36m., same location. An excellent station opening at 7.0 a.m. and sometimes earlier. (Silverthorne, Gaden, Foster, Clack, Hallett, Medina, K.Mc., Lee).

WCBX.—6120kc., 49.02m., same location. This frequency is very poor and not heard at all well now in afternoon. (Medina).

WCBX.—6170kc., 48.62m., same location. This outlet being used in January. Heard well till after 6.0 p.m. on New Year's Day.

WGEA.—21,500kc., 13.96m., Schenectady, N.Y. Only heard weakly now, and possibly not at all in some locations. (Gaden).

WGEA.—15,330kc., 19.57m., same location. Heard quite well in the morning. Gives news at 7.30 a.m. (Gaden, Medina, Foster, Clack).

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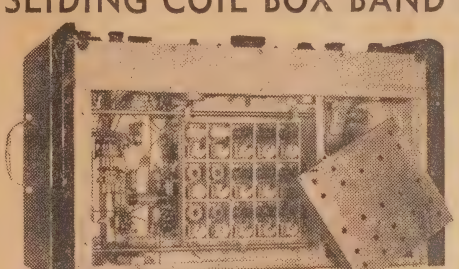
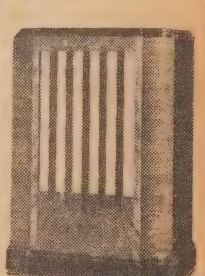


Illustration at left shows sliding coil box with cover removed. Note the coils with air dielectric trimmers mounted in separate shielded compartments. A knob on the front panel sets the coil box in operation.

For years, short wave enthusiasts have cast longing eyes at illustrations and specifications of American communications receivers. The prohibitive cost, running into something like £100, has always been the obstacle to acquiring one. This Sky-Raider, wholly produced in Australia, has all the refinements of the most expensive imported sets and in performance it is comparable with the world's best! And yet, with all its magnificence its price is within the reach of the average home! Easy terms available!



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This speaker console is a floor model to house the special 12-inch concert speaker. Cabinets to house both set and speaker available if desired.

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10 BARRACK ST., SYDNEY (RIGHT NEXT DOOR TO LOTTERY OFFICE.)

NORTH AMERICA (Continued)

WGEA.—9550kc., 31.41m., same location. This one was only reported by Dr. Gaden, who has heard it weakly on some occasions.

WGEO.—9530kc., 31.48m., same location. Heard best in the mornings from 7.0 a.m., but also in afternoon. News., 7.30 a.m. and 3.45 p.m. (Silverthorne, K.Mc., Lee, Medina, Gaden, Hallett, Clack).

KGEI. — 9530kc., 31.48m., Treasure Island, Cal. Can still be heard opening at 10.0 p.m., but badly interfered with and not as loud as formerly. (Gaden, Cox, Foster, Medina, Shields, Lee).

KGEI.—15,330kc., 19.57m., same location. Can still be heard fairly well at lunch time. Gives news at 2.0 p.m. (Medina, Gaden).

KKQ.—11,950kc., 25.11m., Bolinas, Cal. Heard often in the afternoon with special programmes. (Gaden).

KKQ.—13,690kc., 21.91m., same location. Not as loud as theother transmitter in the 25-metre band. (Gaden).

W4XA.—26,150kc., 11.47m., Nashville, Tenn. This is the loudest of the 11-metre band stations in the forenoon. (Gaden.)

W9XH.—26,050kc., 11.52m., South Bend, Ind. The best time to hear this one is around 9.0 a.m. (Gaden.)

W9XPD.—25,900kc., 11.58m., St. Louis, Mo. Only heard weakly, the best time being 11.0 a.m. (Gaden.)

W8XNU.—25,950kc., 11.56m., Cincinnati, Ohio. This Crosley station is a regular on this band at 11.0 a.m. (Gaden.)

XEWW.—9500kc., 31.57m., Mexico City, Mexico. Always audible late at night and occasionally in the early morning.

XEQQ.—9680kc., 30.99m., Mexico City, Mexico. Still heard well till 4.0 p.m. sometimes 4.30 p.m. Slogan is "Radio Panamericana," and address Apartado 950, Mexico City. This station is XEQQ, as we first thought, instead of XEWQ, as shown last month. (See last month's article.)

MISCELLANEOUS

HVJ.—15,120kc., 19.84m., Vatican City. Only heard on a few occasions early in December. (Medina, Clack.)

HVJ.—11,740kc., 25.55m. This one is now used for the Tuesday night broadcast from 11.30 p.m. till midnight.

HBO.—11,402kc., 26.32m., Geneva, Switzerland. Only heard on Sundays around 5.30 p.m. at fair strength. (Foster, Lee, Clack.)

HBJ.—14.535kc., 20.64m., same location. This one is heard at same time as HBO. (Foster, Lee, Clack.)

HAS3.—15,370kc., 19.52, Budapest, Hungary. On some Sunday nights is quite fair strength, opening at midnight.

PCJ.—9590kc., 31.28m., Huizen, Holland. On Monday mornings is good till 6 a.m. and on Wednesday till 6.30 a.m. (Silverthorne, Foster.)

PCJ2.—15,220kc., 19.71m., same location. The Tuesday evening broadcasts are now discontinued, but is good nightly from 10.40 p.m. (Gaden, Battis, Medina, Silverthorne, Clack.)

PHI2.—17,770kc., 16.89m., same location. Now very hard to separate this one from the Frenchman. (Silverthorne, Battis.)

SBT.—15,155kc., 19.8m., Motala, Sweden. Only heard on Sunday night now, English announcement on opening at 6 p.m. (Battis.)

SBP.—11,705kc., 25.63m., same location. On some mornings can still be heard at fair level till 7.15 a.m.

TAP.—9465kc., 31.7m., Ankara, Turkey. Interesting items re the earthquake were heard from this station. Only fair strength at night, but good in the early morning. (Gaden, Silverthorne, Medina, Foster, Lee.)

CSW4.—15,215kc.. 19.71m., Lisbon, Portugal. This is an excellent station in the early morning after 2 a.m.

CSW5.—11,040kc., 27.17m., same location. This one is not as loud as a few weeks ago in the very early morning. (Gaden, Silverthorne, Foster.)

CSW7.—9740kc., 30.8m., same location. Very good on closing at 7 a.m. and also on re-opening at 7.15 a.m. (Gaden, Medina, Silverthorne, Foster, Lee.)

EAQ.—9855kc., 30.45m., Madrid, Spain. Only heard occasionally, and then only at weak level around 6 a.m. (Gaden, Foster, Medina.)

ORK.—10,330kc., 29.04m., Ruysselede, Belgium. This one reported by Mr. Silverthorne as audible in South Australia.

YUA.—6100kc., 49.18m., Belgrade, Yugoslavia. This station is very weak in early morning. (Medina.)

YUC.—9505kc., 31.56m., same location. Still coming in well in mornings, but interfered with by GSB. News about 7 a.m. (Gaden, Medina, Lee.)

ZAA.—6085kc., 49.3m., Tirana, Albania. A very good station in the early morning on opening at about 3.30 a.m.

LKV.—15,170kc., 19.78m., Oslo, Norway. Another good station in the 19 metre band from about 1.30 a.m.

LKQ.—11,735kc., 25.57m., same location. This one has unexpectedly been heard at fair level around 11 p.m.

From this issue, Ray Simpson's mail bag will be handled through the "Answers to Correspondents" columns of Radio and Hobbies. If you have written to Mr. Simpson, turn to page 80 for your reply.

AFRICA

ZRL.—9606kc., 31.23m., Capetown, South Africa. Easily identified in the early mornings around 2.0 a.m.

ZRO.—9755kc., 30.75m., Durban, South Africa. Another station heard well at the same time.

ZTE.—11,770kc., 25.49m., same location. This one has a stronger signal at the same time as ZRO.

ZRH.—6007kc., 49.94m., Pretoria. Still audible in the mornings, 6.30 a.m. and 7.0 a.m. (Hallett.)

ZNB.—5900kc., 50.85m., Mafeking, British Bechuanaland. On some mornings is quite good just after 5.0 a.m.

CR7AA.—6020kc., 49.83m., Lourenco Marques, Mozambique. Very weak in mornings between 5.30 a.m. and 6.0 a.m.

CR7BE.—9640kc., 31.12m., same location. This is the new station mentioned in separate article.

VQ7LO.—6083kc., 49.32m., Nairobi, Kenya. Not as strong as a few weeks ago, but still fairly good around 5.0 a.m.

ZRK.—6097.5kc., 49.2m., Capetown. Heard by Mr. Hallett at 6.0 a.m., but with much interference.

Radio Tananarive.—9695kc., 30.95m., Tananarive, Madagascar. Only heard faintly now, opening at 1.0 a.m. (Medina.)

12AA.—9650kc., 31.09m., Addis Ababa, Italian East Africa. When it opens at 1.0 a.m. is the loudest on the band.

FRANCE

TPA2.—15,245kc., 19.68m., Paris. This station is heard from good to very good at different locations. (K.Mc., Foster, Medina, Gaden, Clack, Lee.)

TPA4.—11,718kc., 25.6m. Heard at fair strength in afternoon, with news in English at 2.30 p.m., also between 3 p.m. and 3.30 p.m. (Clack, Silverthorne, Foster, Medina, Gaden, Shields.)

TPB3.—17,775kc., 16.88m. This is one of the best French stations, and is much better on this new frequency. (Foster, Lee.)

TPB6.—15,130kc., 19.83m. Heard in December from 4 p.m. till 8 p.m., with news at 6.15 p.m. Not now in use. (Foster, Battis, Shields)

TPB11.—7280kc., 41.21m. Still being heard at quite good strength in early morning. News in English at 5 a.m., also heard faintly 6.15 p.m. with news. (Battis, Gaden, Foster.)

TPB11.—11.885kc., 25.23m. Heard at fair strength in the afternoon with news at 2.30 p.m. (Medina, Silverthorne, Foster, K.Mc., Gaden.)

TPB12.—11,885kc., 25.23m. This second transmitter on the same frequency is only heard weakly around 10.30 a.m. (Medina.)

—.—11,843kc., 25.35m. This is a very loud station at 7 a.m., and gives news in English at 5 a.m. (Hallett, Foster, Gaden.)

—.—9680kc., 30.99m. This one is now fairly weak in the afternoons, gives news at 2.30 p.m. (Gaden, Battis, Medina, Foster.)

SOME NEW STATIONS

WE list below all definitely identified new stations, or those heard for the first time. In cases where actual letters are not known, the station will be listed under its location, until such time as its call can be definitely given.

KC.	Metres	Call	Location
6,030	49.75	HP5F	Colon, Panama.
6,056	49.54	———	Rangoon, Burma.
6,360	47.17	COCQ	Havana, Cuba.
7,968	37.65	HSP6	Bangkok, Thai.
9,590	31.28	VLQ5	Sydney, N.S.W.
9,615	31.21	VLQ	Sydney, N.S.W.
9,640	31.12	CR7BE	Lourenco Marques, Mozambique.
9,840	30.47	XGSE	China.
11,850	25.32	"Radio Indo-Chine"	Saigon, French Indo China
11,870	25.27	VLQ2	Sydney, N.S.W.

FREQUENCY CHANGES

VLR3	11,850kc.	FROM	11,880kc.
VLW2	9,650kc.	FROM	9,560kc.

SOUTH AMERICA

HJFK.—9740kc., 30.8m., Percia, Colombia. Opens at good strength every night at 10 p.m. (Gaden, K.Mc., Foster.)

OAX4J.—9340kc., 32.12m., Lima, Peru. Heard both in the mornings at 7 a.m. and also Sunday afternoons.

CB1170.—11,700kc., 25.64m., Santiago, Chile. Another station which is now good at 7 a.m. and also in afternoon.

CB960.—9600kc., 31.25m., same location. Not regular at night, but fair strength when on, best on Sundays till 3.30 p.m. (Gaden.)

CB970.—9740kc., 30.8m., Valparaiso, Chile. Another irregular, and interferes with HJFK when it is on at night.

HCJB.—12,460kc., 20.08m., Quito, Ecuador. Varies from night to night and usually is weak only till it closes at 11.15 p.m. (Foster, Clack, Gaden, Medina.)

LRA1.—9690kc., 30.96m., Buenos Aires, Argentine. Can now be heard weakly when it opens at 8.30 a.m.

LRA3.—11,730kc., 25.58m., same location. This one can also be heard weakly at 7 a.m., when WRUW is off the air.

CB1180.—11,970kc., 25.06m., Santiago, Chile. Still heard at fair strength till 2 p.m. (K.Mc.)

OAX4Z.—6077kc., 49.37m., Lima, Peru. Heard by Dr. Gaden at 10 p.m., but not at our location.

HJ.—9750kc., 31.35m., Colombia. This unindentified Colombian can be heard every morning from about 6.30 a.m. See article.

CENTRAL AMERICA AND WEST INDIES

TILS.—6165kc., 48.66m., San Jose, Costa Rica. This one was heard in New Year programme till 7 p.m. on January 1. (Gaden.)

TIPG.—9615kc., 31.21m., same location. This one is now being heard in mornings at 8, as well as at night. (K.Mc., Medina, Gaden.)

HP5A.—11,700kc., 25.64m., Panama City, Panama. Comes in nicely every night from 10 p.m. onwards. (Gaden.)

HP5F.—6030kc., 49.75m., Colon, Panama. Heard in special programme on January 1, till it closed at 6.50 p.m.

HP5J.—9610kc., 31.2m., Panama City, Panama. On some nights can be heard weakly, but hard to separate from nearby stations.

HP5K.—6000kc., 50.0m., same location. Quite good strength at 10 p.m. English announcement on opening.

COCQ.—8830kc., 33.98m., Havana, Cuba. Improved in strength since last month, but still rather weak.

COCQ.—6360kc., 47.17m., same location. This additional frequency is now heard better than the one on 33.98m. (Gaden.)

COCH.—9473kc., 31.8m., same location. Quite good strength at night, but spoilt by morse interference. (Foster.)

COBC.—9360kc., 32.04m., same location. This is now the best of the Cubans at night from 10 p.m. (Gaden.)

COHI.—6460kc., 46.44m., Santa Clara, Cuba. This new Cuban is also good every night. On opening gives list of all stations on the chain. Address is P.O. Box 376, Santa Clara. (Clack.)

COGF.—11,800kc., 25.42m., Matanzas, Cuba. Best between 7 a.m. and 7.30 a.m., when JZJ is off the air.

TGWA.—15,174kc., 19.77m., Guatemala City, Guatemala. This is the best 19 metre band station on Monday mornings till 8.15 a.m. (Medina, Cox.)

TGWA.—9685kc., 30.98m., same location. This popular 31 metre band station is still heard well in the afternoons. (Silverthorne, K.Mc., Medina.)

TGWB.—6480kc., 46.28m., same location. Only heard on Sunday afternoons, and not as strong as TGWA. (Foster, Gaden.)

TG2.—6195kc., 48.43m., same location. Not heard at night now, but still audible on Sunday afternoon. (Foster.)

TGQA.—6400kc., 46.88m., Quezaltenango, Guatemala. Heard weakly at night at 10 p.m. by Dr. Gaden.

INDIA AND ASIA

VUB2.—4880kc., 61.48m., Bombay. Excellent children's session on Friday nights at 10.30 p.m. (Lee, Gaden.)

VUC2.—4840kc., 61.98m., Calcutta. This same session is heard from the Calcutta station. (Lee, Gaden.)

VUM2.—4920kc., 60.98m., Madras. This Indian is usually much weaker than the others. (Lee, Gaden.)

VUD8.—4960kc., 60.48m., Delhi. This one carries the same programme as VUD2 in the 31 metre band. (Battis, Lee, Gaden.)

VUD2.—9590kc., 31.28m., same location. One of the loudest stations on this band. News at 10.30 p.m. (Lee, Silverthorne, Medina, K.Mc., Foster, Gaden.)

VUC2.—9535kc., 31.47m., Calcutta. This little heard Indian was on the air one night broadcasting a cricket match between Bengal and some other team. Closed at 9.15 p.m.

KZRM.—9570kc., 31.35m., Manila, Philippine Islands. Good signal from this station nightly from around 8.30 p.m. Also announces as KZRF. (Lee, Silverthorne, Medina, K.Mc., Foster, Battis, Gaden, Clack.)

KZRB.—19.3m. (frequency not known). Heard by Mr. Medina testing at 5.30 p.m. one day with good signal.

KZRF, KZEG.—6140kc., 48.86m., same location. One of the loudest stations on the 49 metre band at night. (Foster, Medina, Gaden, Lee, Clack.)

KZRH.—9635kc., 31.13m., same location. This is an excellent station every night. (Hallett, Silverthorne, Richard, Lee, Cox, Clack, K.Mc., Foster, Gaden, Battis, Medina.)

KZRH.—6090kc., 49.25m., same location. Also heard nightly, but not nearly as good as the 31 metre one. (Medina.)

KZIB.—6040kc., 49.67m., same location. Another of the Manila stations heard fairly well every night. (Lee, Foster, Medina.)

KZIB.—9500kc., 31.58m., same location. This 31 metre band outlet is much better than the 49 metre one. (Lee, Foster, Medina, Clack.)

RADIO SAIGON.—11,780kc., 25.47m., Saigon, F.I.C. One of the loudest stations on the air. English sessions at 9 p.m., 11.30 p.m. and 1.30 a.m. (Hallett, Silverthorne, Lee, K.Mc., Foster, Medina, Battis, Gaden, Clack.)

RADIO SAIGON.—6116kc., 49.05m., same location. This one reported by Mr. Hallett and Mr. Medina, but not heard at our location.

MTCY.—11,775kc., 25.48m., Hsinking, Manchukuo. Opens every morning at 7 a.m. and gives news till 7.15 a.m. (Shields, K.Mc., Lee, Foster, Medina, Clack, Gaden.)

MTCY.—6125kc., 48.98m., same location. A loud signal from this one, but only native type programme. (Gaden, Foster, Medina.)

HSP6.—7968kc., 37.65m., Bangkok, Thai. This is the new station shown in stop press last month. HS6PJ and HS8PJ not now in use. (Medina, Foster, Clack.)

ZHP.—9690kc., 30.96m., Singapore, S.S., Still audible, but interfered with now by the Russian and other stations. (Lee, K.Mc., Foster, Clack, Medina, Gaden.)

WHO'S WHO IN MAGIC

KNOWN all the world over as "The Watch King," Gus Fowler is one of the greatest magical specialists of all time. He now styles himself as a Chronometrical Illusionist, a catchy and explanatory title of his wonderful act.

He has specialised in tricks and illusions with watches and clocks, just as others have specialised in tricks with cards, balls or cigarettes. He has multiplying watches, vanishing watches, changing watches, diminishing clocks, magical production of ringing alarm clocks from a hat, disappearing and re-appearing production clocks and watches of all sizes. Anything magical that can be done with watches or clocks, Gus Fowler has done or can do it. Apart from the novelty of his act, above all, he is a great magician and performer.

GUS POWER

Going from England to America he established a record never attained by any English performer in that country performing this particular type of magic. At the close of his American season, he completed seventy-seven weeks of continuous dates, covering the whole United States, from the Atlantic Coast to the Pacific, and from the extreme north to the southern limits. Return dates at every big theatre in the country were common. Gus broke the record of appearances at the Palace Theatre, New York (America's best vaudeville theatre), where he played two engagements in six months, and received six curtain calls at almost every show, and never less than four at any performance.

Nothing like his act, either in itself or in the manner of presentation, has ever been offered before. His personal charm of manner in meeting brother magicians, both professional and amateur, is so marked that you realise at once that you have met a real friend.

MAGIC AND MAGICIANS

by Barry Kent

Dr. Thomas Tapper, of The Institute of Musical Art, New York City, once wrote an article concerning the study of music and piano playing, which might well have been written to apply to magic. Following his idea, the following application to magic will give you words for thought. Think it over.

WHY should anyone study magic? Why learn to do sleight-of-hand tricks when mechanical tricks will do it for you?

Why not buy all our apparatus ready to work as we buy a tin of salmon?

There is a reason. And this is it:—

The human mind loves to understand things. And to make sure that we shall go about understanding things in the right way, life has so endowed us that we take delight in DOING things.

You see the scheme of wise Old Mother Nature. She makes us love to DO things, so that by trying over and over again, we shall finally succeed in understanding them. And understanding, you remember, is the beginning of wisdom.

DO IT YOURSELF

The way to understand the game of golf is not to sit at home and read books about it. You go out on the course with one who knows and you try your hand at it. You play a bad game over and over again. Your friends laugh at you and the caddy laughs at you. But by-and-by the swing and rhythm of it come into your shoulders and arms and body. And pretty soon someone remarks, "So-and-so is playing a fine game of golf."

You experience a great sensation, namely, there is a lot of fun in DOING things, and the feel of the DOING in brain and muscles is one of the great joys of life. So with MAGIC, doing sleight-of-hand, for instance—no matter how well your friends do it or how natural it looks using mechanical apparatus, the real joy comes from understanding the operations with your own mind and making the motions with your own fingers.

Control, skill, ability to give pleasure to others, and, best of all perhaps, another peep into the mystery of God's Universe—all these things are the fruits of trying and learning to DO things.

WHY NOT MAGIC?

So let us learn MAGIC! The mind will take up this new activity with eagerness and pleasant anticipation. It begins by trying to tell the arms, the hands and the fingers what to do. At first these stumble, for there is a new understanding to be worked up. But following the old adage of try, try again, skill begins to come to the fingers on the passes, as it comes to the body on the golf course. The moves you make at the beginning are not as smooth. Your game is poor. But patience—and then there follows a lot of joy, for the mind is beginning to be pleased beyond measure, to feel that it is getting a grip on the game.

Pretty soon, fingers that only a little while back could not move skilfully now are able to do all kinds of passes, manipulations, &c. How has it come about? By the mind seeking to understand, while the hands work faithfully alongside.

Between them—and by DOING good team work—mind and hand can accomplish everything that the art of magic demands. What is the skyscraper but the child of mind and hand? And the painting? And the modern steamship? And the MAGIC you do? All are children of the understanding mind and the doing hand.

PRACTICE MAKES PERFECT

So, after a while, you find you can do lots of tricks. Striving to do this has resulted in your receiving the perfect gift—the gift of SKILL. You can now, in turn, give delight to others, making them sharers in your understanding and skill. ON NO OCCASION WHEN YOU ARE ALONE WILL YOU EVER AGAIN BE LONESOME. On no occasion when you are with others will there be need for any of you to be without uplifting thought and pleasant entertainment, for these are the heart of MAGIC.

It is a pleasure to put a record on the phonograph and hear the great artists sing their songs; it is a great pleasure to see an accomplished sleight-of-hand artist. But there is so much joy in trying it yourself, learning to do it with a skill and art and feeling. Nothing else in the world quite approaches it. See the great artists and magicians by all means, then try to better yourself. That is how we improve the game.

And let us remember the words of Solomon: "He that keepeth understanding shall find good." Which means, the more understanding you get, the more joy you are capable of giving. Practice! Practice! Practice!

PIFF-PAFF-POOF—AND VANISH!

First photo: The trick as seen by the audience.

Second photo: How it is done.

SIMPLE TRICK WITH PAPER BALLS

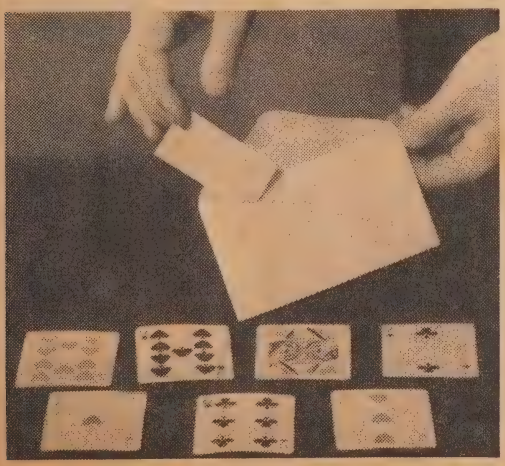
THIS is one of the best little pocket tricks you could wish for. Three small balls of paper are counted several times from the left hand to the right, showing the fingers wide apart and obviously unprepared, and with nothing concealed. One, two, three, each time showing the THREE balls in the hand. Now, on the last count, say the third time, you place the THIRD ball in your mouth, drawing attention to this action, at the same time closing the left hand with TWO balls in it. Now you command the ball in the mouth to leave and unite with the TWO in the left hand. Hey, presto! And, One, Two, Three. The hand is opened, and there they are. This can be repeated again without fear of detection. (See first photo.)

HOW. An extra piece of paper rolled into a ball is secreted in the right hand between the first and second fingertips. The hand held down while counting the other pieces into the left hand, conceals the FOURTH piece. The fourth piece is transferred to the left hand as you count the pieces into it, and left there as you count TWO. Be sure to close the hand immediately you place the pieces in it each time. On the THIRD count, place the last piece clearly in the mouth. Then, hey, presto! Roll the three pieces from your left hand, and retain the fourth piece in the mouth without comment. (See second photo.)

MATERIALISED THOUGHT TRANSFERENCE

This is a bewildering and simple trick. The performer spreads seven cards in a row on the table. He exhibits a small sealed envelope which he places in his pocket. After some one selects one of the seven cards, it is burned to ashes, the ashes are rubbed between the hands and thrown into the air. The envelope is now handed to a spectator and upon opening it, the name of the card selected will be found written on a slip of paper inside.

HOW. The magician has seven small envelopes, each one containing the name of a single card. Six of these are in his pocket when he begins, in regular order, so he can instantly find the one he desires. The remaining one is shown as if it were the only one being used, and then tucked away with the six others. The rest of the trick should now be clear.



★

What you want for the trick. Here are the seven cards on the table, and one of the envelopes and cards. Considering its simplicity this is one of the most effective tricks you could desire.

★

THROW YOUR VOICE

into a trunk, under the bed—anywhere.

THE VENTRILO

An instrument fits into the mouth; cannot be detected. With the aid of this Double throat or VENTRILO you can imitate birds, animals, etc. Everything for ONE SHILLING, including a FREE booklet giving you full instructions how to become a Ventriloquist and throw your voice.

Will Andrade 173 PITT ST., SYDNEY. 52 Swanston St., Melbourne.

SEERSHIP PREDICTO!

This trick requires very little skill, yet the effect is amazing. What the audience perceives is that, having placed a pack of cards in a hat which you have borrowed, you hand them out to be shuffled by all who desire to do so.

You then drop the pack into the hat again and cover it with a handkerchief so that it can be violently shaken by anyone inclined to mix the cards further. You are then securely blindfolded and immediately call out the names of several cards at random; these are taken from the hat singly by you and passed for inspection. Cards called for by you are immediately located and handed for further examination.

HOW IT IS DONE

To perform this trick, which is well worth learning, you first decide which cards you are going to call for. These you clip together with a slip-on paper clip, and keep them at the back of the pack.

When you receive the hat you ask for, say that you are going to place the cards in the hat, suiting the action to the words by dropping the pack in. Then remarking: "But first they must be shuffled," then remove the cards, but leave in the hat those clipped together. It is then a very easy matter to find the cards, because of the clip, and to remove them one by one, but you must memorise their order, or you will not be able to announce them correctly.

SIMPLE VARIATION

To make this trick even more simple to perform without losing effect, try this variation. Clip together the ace, king, queen, jack and ten of Hearts. You cannot forget these, because they are a sequence. When the cards are thoroughly mixed, insert your hand beneath the handkerchief, announcing as you do so that you will produce therefrom a sequence or a Royal flush of Hearts.

The clip should be concealed in the hand that produces the cards. These can be thrown down on the table, face up, and, as every eye will be on them for a moment, the clip can be dropped into your pocket. The hat and the cards therein can then be examined minutely by the audience without result. Although the secret of this trick is very simple, with a good story or patter about your powers of second-sight and sensitive touch, you should be able to make the trick very mysterious and entertaining. Try it.

MORE MAGIC IN THE FILMS

SPOOKY MAGIC

Scene from the magic picture "Charlie Chan at Treasure Island," which you should see. Magic, illusions and psychic phenomena may be seen. Cesar Romero plays the part of The Great Rhadini, clever magician. In the picture above he is seen producing, as he says: "an orchid for you," but what does Charlie Chan think? You'll like this picture.—(Fox Picture.)

Charlie Chan At Treasure Island

Another picture showing much about magic, thought-reading and a little clever ventriloquism is "Charlie Chan at Treasure Island," and all readers interested in magic should not fail to see this thrilling picture. Cesar Romero plays the role of the Great Rhadini, a clever and great magician, with Sidney Toler as Charlie Chan.

AN interesting sidelight on the production of the picture is the fact that the studio tested an expert magician for the role of Rhadini, but could not engage him because it was found that the camera made his remarkable and clever exhibition of magic and sleight-of-hand look like trick photography. It took a good actor, like Romero, to make it look convincing. The picture is a 20th Century-Fox mystery thriller.

In the picture you will see much behind the scenes with great illusionists. Many illusions are seen from behind and below the stage, and in one scene in a "spook" parlor, the psychic secrets of Dr. Zodiac are revealed in an exciting and interesting manner. You will see a good levitation illusion performed, too, finishing with a complete vanish in mid-air, you will also see and hear a good opening item by the Great Rhadini. I will not tell the story, as it would spoil your entertainment when you see the picture—but see it by all means.

PRIZE TO TASMANIA

MAGICIANS' NAMES PUZZLE

IN the December issue I offered a free book prize for a puzzle to test your knowledge of great magicians. The number of correct answers received astounded me beyond words; for I thought there were one or two really hard names that might have offered some difficulty for you. Over sixty correct answers were received, so I decided to place all the correct answers in a box and select one at random on the first day of the New Year, 1940. That was the fairest way I could think of to find out who should receive the free book. The winner is a young magician in Tasmania named M. L. Cassidy, of 14 Brougham-street, Hillside Crescent, Launceston, Tasmania, to whom we offer our congratulations. The book prize has already been posted. The answer to the puzzle showing the correct names of magicians is:—Ali Rahja; Houdini; Levante; Chang; Goldin; Murray; Nicola; Dante; Frakson; Thurston; Cardini; Rooklyn.

In addition to the correct answers received there were a large number who had eleven names correct, and quite a few had only ten names. Look out for my next puzzle, with another free book prize.

THE MYSTICAL NINE

THIS is a unique example showing the queer properties of the number 9. It is possible to use problems like this for public entertainment by the use of a blackboard and chalk. Make up a good story to tell while presenting the item, and you will be surprised with the effect and the reaction of the audience.

9 x 9	plus	7	equals	88
9 x 98	„	6	„	888
9 x 987	„	5	„	8888
9 x 9876	„	4	„	88888
9 x 98765	„	3	„	888888
9 x 987654	„	2	„	8888888
9 x 9876543	„	1	„	88888888
9 x 98765432	„	0	„	888888888
9 x 987654321	minus	1	„	8888888888

MYSTIC NUMBERS

IN the December issue of "Radio and Hobbies" there appeared a number problem under the name of "Mystic Numbers," in which a mistake was made in the numbers given in the trick. It should read:

```
  9 1 8
— 8 1 9
-------
  0 9 9
Add 9 9 0
-------
  1 0 8 9
```

Turn back to the December issue and try this interesting mysterious figure problem now. The answer will always be 1089, irrespective of what numbers are used by members of your audience.

Hey Presto!

Abracadabra!

It's now 1940. Happy and prosperous New Year to you all, my magician friends. Our New Year resolutions should be—more practice, more rehearsals, better magic, brighter magic, smarter patter and above all better presentation.

To those of you who sent me Christmas and New Year Cards, letters and greetings, I can only say "Thank you," and return to you all my sincerest wishes for happiness and prosperity in our new year. There are far too many for me to reply to personally, so please accept this "Hey Presto" paragraph as my reciprocal greeting to you.

I was more than amazed with the number of magicians who sent in replies to my Magician's Names Puzzle, and I was surprised with the number who had all the names correct. I know now that you really know your magicians. The winner's name appears in this issue. Those of you who wrote me letters with your entries, please just bear with me for a week or so, and I will reply to all questions personally in writing.

My thanks also goes to those who forwarded me suitable tricks and items for publication in our future issues. I would like more to send me such tricks and interesting matter of this kind. Also, I would like more photographs of amateur magicians for publication. I still have a number to use, and will do so in future issues. If possible send the negative together with the print, unless the photograph is a fairly large one, then the photograph only will be sufficient.

The Christmas period was very busy for magicians in Sydney, and I feel sure that they can all report "wonderful times" for the Christmas and New Year periods of 1939-40.

Readers who would like pen-friends should send me their names and addresses soon, as I have a number of magician readers who would like to begin the New Year well by corresponding with interesting people whose hobby is—M A G I C.

So, until next month.

Ching Ling Foo.

Barry Kent.

THE IMPS

READERS who have written to me about the Magicians' Club of Sydney, called THE IMPS, should note the names and addresses of the various officers of the club shown below. Any information about this excellent club should be addressed to the secretary, who will be very glad to supply you with further particulars about the many functions and happenings of the club.

Editor of The Imp: Mr. J. A. Paterson, 487 Punchbowl-road, Enfield.

President: Mr. F. Scott, 36 Chisholm-street, Enfield, N.S.W.

Secretary: Mr. T. Piper, 274A Elizabeth-street, Sydney, N.S.W.

Business manager: Mr. E. Gage, 53 Oliver-street, Bexley, N.S.W.

The December issue of "The Imp" contains 20 pages of interesting reading for magicians. Club notes; final point score for the Woods Cup; "New Year Bells," by Dr. Rolland Fraser; Review of Magical Magazines; Christmas greetings from Magicians; "Correct Diction in Stage Presentation," by A. Hing, etc. Nice reading.

ATTENDANT at sideshow of well-known magician, Sydney Showground: "Good evening; do you want to consult Woo Bung Wong, the Great Chinese Mystic?"

Lady inquirer from country town: "Sure, and that I do, my fine fellow. You just run and tell him his mother is here from Queensland."

MAGIC MADE EASY!

BALL THROUGH GLASS.—A small box with a hole through the centre of the cover and through the bottom of the box. A sheet of glass is placed in the box. The "ball" . . placed on the cover is seen to sink slowly down through the bottom of the box. In effect, the "ball passes through the sheet of glass." One of the finest close-up tricks in years. Complete 10/6

VASE OF ALLAH.—A piece of rope placed into the neck of this vase and the vase becomes suspended on the rope 2/6

ANTI-GRAVITY GLASSES 2/-
PHANTOM RAZOR BLADE 2/6
TORN & RESTORED NEWSPAPER . . 2/6
PRESTO MYSTERIOUS COIN BOX . . 2/6
BALL ESCAPO 3/6

CHINESE LINKING RINGS.—A set of these famous Rings link and unlink at the magician's will. Size, 6ins. Set 10/6
Egg Bag Trick 3/6
King Pack of Cards . . 3/6
Cigarette Catching Trick 1/-

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Sneeze Powder . . 6d
Snake Fountain 1/6
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BECOME A MAGICIAN!

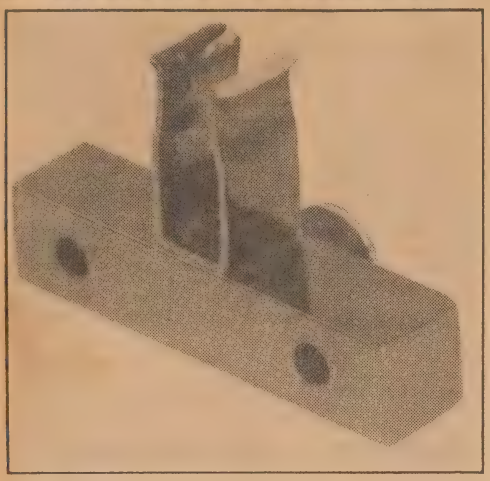
Send 3d in Stamps for Booklet and Catalogue of Jokers' Novelties and Magic combined.

Magic Dept. Ground Floor.

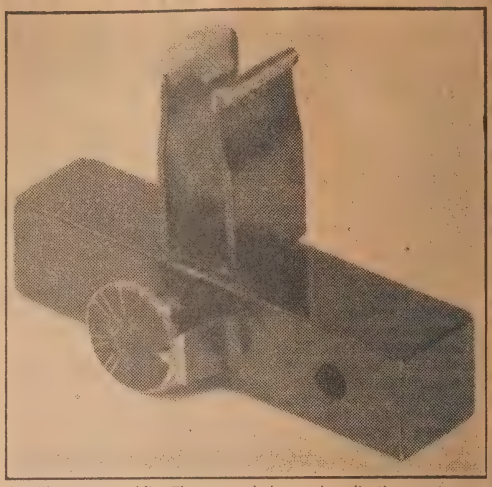
MICK SIMMONS LTD.

712-722 George Street, Haymarket, Sydney.

A RANGE-FINDER FOR PHOTOGRAPHY



The range-finder from the front. Note the two sighting holes.



The "business end." The peep-hole and adjusting nut are seen here.

Here is a useful and thoroughly practical article giving full instructions for building a range-finder which will give excellent results. It is very easy to make, and the cost of the materials is quite trifling. It can be clipped to the camera, or used as a separate instrument.

By A. J. BARNES

GUESSWORK in focusing is always a doubtful business and is often responsible for pictures which are not "dead sharp." Here is a miniature range-finder which works exactly on the same principles as those used in modern artillery practice.

HOW IT WORKS

A mirror is fixed at an angle of 45 degrees inside one end of a square brass tube. The top half of this mirror has no silver coating and is, therefore, merely clear glass. A peephole is drilled right through the tube so that the object to be ranged can be seen directly through the clear upper half of this fixed mirror.

At the other end of the tube we have a pivoted mirror of the same size, but with no clear glass section. A hole is drilled in the tube opposite this pivoted mirror.

On looking through the peephole we will see two images of the object to be ranged. One is the direct image through the clear upper half of the fixed mirror and the other appears on the same mirror by reflection from the pivoted mirror, which collects its image through the hole in front of it.

The pivoted mirror is moved in either direction by the action of a screw working against the extended pivot bracket. This screw is turned slowly until the two images overlap and form a single image. The exact distance from the object is now indicated on a small dial attached to the adjusting screw.

CONSTRUCTION

File the ends of the square tube true and cut two 16g. plates to cover them. On one side of this tube drill two 5-16in. holes and opposite one of these drill a ¼in. peephole. Solder the nut in place and drill and tap right through.

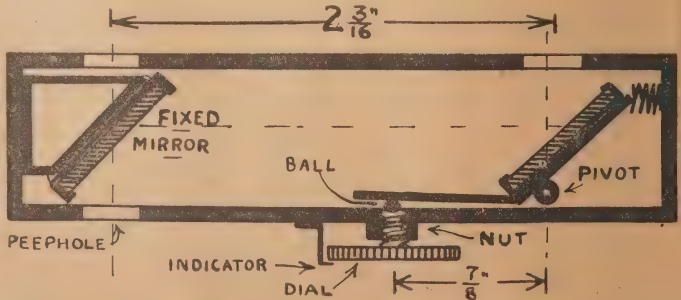
Cut a ¾in. disc of 16g. brass, drill and tap the centre and solder to the end of the screw. Cut off the head of the screw, leaving a length of ⅝in. Centre-punch the end and solder the ball in place. Clean any solder out of the thread.

THE MIRRORS

These are ¾in. square pieces which are easily cut from a thin vanity mirror. In our own case a slight scratch with a file ensured a clean break. To obtain a clear upper half for the fixed mirror, we use a razor blade, first making a centre line and then scraping away the coating.

The next job is to make two 24g. clips into which the mirrors will push tightly. Next we bend up the fixed mirror bracket from 24g. and the pivoted mirror bracket from 16g. To the latter is soldered the piece of tubing which is a neat fit inside the square casing.

The mirror clips may now be soldered to their respective brackets. After making sure of the 45 degree angle, the fixed mirror assembly may be now soldered to one end plate and the whole pushed into the casing square and true.



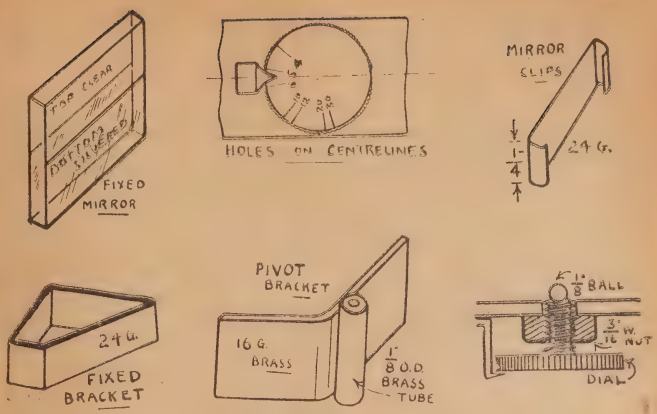
Plan view of the range-finder. Note the return spring for the pivoted mirror and the ball point on the adjusting screw.

Solder around the edges of the end plate lightly only so that the remainder will not get too hot.

The pivoted mirror is located by a piece of straight 3-32in. brass wire passing through top and bottom of the casing and, of course, through the round

MATERIAL REQUIRED

3½in. of ¾in. square brass tubing.
Small scraps of 16g. and 24g. sheet brass.
1 ¾in. steel ball.
1 small vanity mirror.
1 3-16in. Whit. (24T.) brass bolt and nut.
1 piece ¼in. O.D. brass tubing, ¾in. long.
1 small spring.



Some sketches of the bits and pieces required. The top row from left to right show how the mirrors are made. Next we see details of the adjusting screw, and one of the mirror clips. The bottom row shows the bracket for the fixed mirror, then the bracket for the one which moves. Finally, we have a detailed sketch of the adjusting screw.

brass tube. The ends of this pivot pin are then riveted over.

Now we solder the small spring to the remaining end plate, so that it will bear against the pivot bracket when the end plate is lightly soldered in position.

The last constructional operation is to cut the pointer and solder it in place.

As far as possible descriptive and possibly confusing detail has been avoided. The sketches are in proportion and all essential measurements are shown.

CALIBRATION

Set up the range-finder at a fixed position—say, in the side passage. Take a white painted stick and with the aid of a tape measure push it into the ground at various distances from the range-finder. At each setting adjust the finder for a single image and mark the dial correspondingly. It is a good idea to mark the same distances on the dial as those marked on the camera focusing scale. If the range-finder indicates a distance between two markings, say, for instance, between 12 and 20 feet, focusing will be accurate if the scale is set to a similar position.

In the photographs you may notice an external bracket not so far described. This merely enables us to clip the range-finder into the accessory shoe on top of "minnie."

DID ROBOT SUB. SINK H.M.S. COURAGEOUS?

(Continued from Page 7)

The control officer could not see where to guide his robot unless he were on the surface.

Now, the distance over which the control is practicable is not likely to be very great. Remember that the mechanism must not respond to any signals except those from the control vessel. This means that the signal from this vessel must be so strong that any possible interference from static or from another ship must be so weak in comparison that it will not set the mechanism working on its own account.

So, the two vessels, control and controlled, cannot be separated by a great distance, apart from the fact that they must also be kept within sight of each other.

UNDERWATER AERIALS

In the case of the robot submarine, it must also have an aerial system tuned to the transmitter. But how could this be, if it is travelling under water? And, if it is not travelling under water, how long could it hope to escape detection?

The fact that there would be no men inside doesn't help much, because it can be put out of action just the same by a direct hit. More than this, the reverberation of explosions round it would almost certainly jar the delicate control gear out of action.

Naturally, a zig-zagging submarine filled with explosives isn't a nice thing to have dodging round big ships, but once its control has vanished it would probably run round in circles, and thus easily be avoided and destroyed.

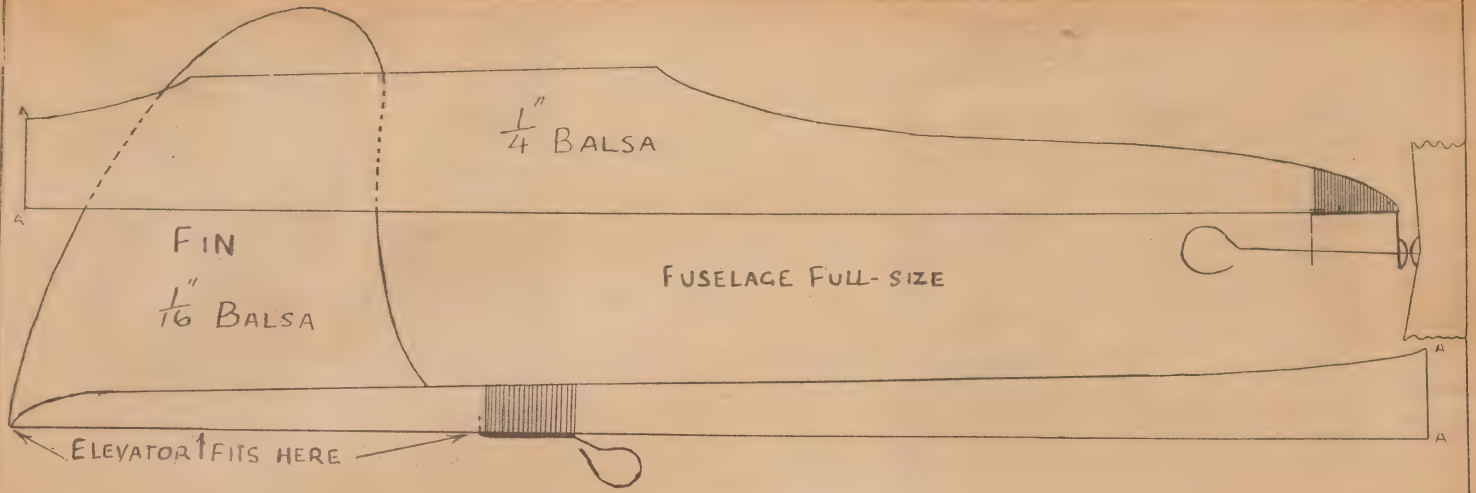
PROBABLY PROPAGANDA

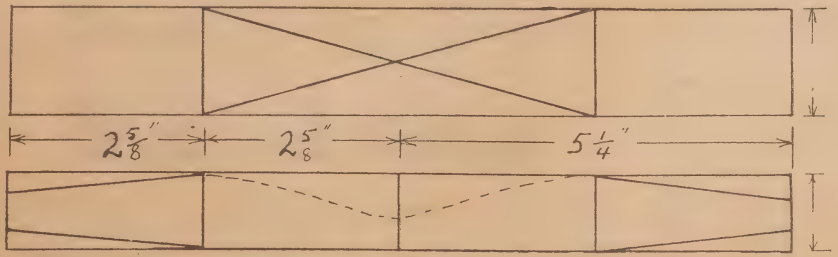
All things considered, it is far more likely that the story was invented by some ingenious mind in an attempt to make us think that here is a secret weapon the Germans have evolved, and which will spell disaster for our shipping. We can safely assume that the sinking of the Courageous was one of those things which are likely to happen in the fortunes of war, and the Allies are just as likely to share in such fortunes as anybody else.

At the same time, we must not think that radio-controlled instruments of war are not likely to be used. Subject to a few obvious conditions, some of which we have already pointed out, it is almost certain that sooner or later, aeroplanes, for instance, will be used without pilots.

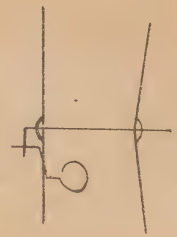
In many cases, such machines might be more useful than those controlled from the air. The control point might be situated so as to have a better view of what is happening than the man in the plane. Although, of course, direct radio communication might be just as valuable, except that if shot down, the plane would not cause lives to be lost.

This is probably the most attractive thing about radio control. It will allow machines to be sent into positions where men might not be able to go without certain death. A sudden attack by radio controlled tanks could probably hit harder than one controlled by gunners and pilots. But the complexity of control, bearing in mind that possibly 50 tanks would be involved, with individual control for each, seems to make such an idea almost hopeless. One or two tanks out of control might easily wreck the whole campaign, while the picture of frantic operators desperately working switches and dials in an endeavor to miss each other's tank is reminiscent of Luna Park and a floor full of Dodgems!





PROPELLER NOT-SCALE



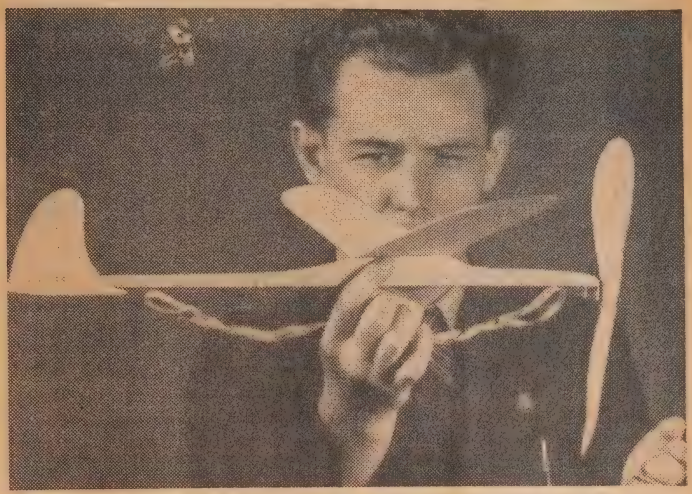
FREE-WHEEL DETAIL

BEARING DETAIL
FULL SIZE

END VIEW NOT-SCALE
NOTE WING & TAIL POSITIONS

THE BUZZ-FLY PLANE GROWS UP

By
JOHN CAVILL



John Cavill shows how and where to balance the new "Buzz-Fly." A little extra weight on the nose may be required.

The popularity of the original "Buzz-Fly" plane has convinced us that in these easy-to-make solid models, we have struck something well worth exploiting. The plane described here, if carefully built, is likely to do almost anything in the way of splendid flights. And it's no harder to make than the original plane.

NOT long ago we presented the plan of a 15-inch all-balsa model, so simple that the veriest beginner could build it.

It was capable of good flights, but, naturally, its performance was limited.

Working along the same lines we have produced this new bigger version of the Buzz-Fly, which retains the simplicity and strength of the original, but with infinite flight possibilities.

Pay particular attention to the wood you choose for this model. A great deal depends on the balance which can be affected if wood is chosen haphazardly.

THE WING

The plans shown are full size. Commence construction with the wing.

For this you will need a sheet of balsa, 24in. long, 3in. wide, and 3-32in. thick. It should be light and soft and yet have a reasonable amount of strength.

One half of the wing is shown on the plan; a cardboard template or pattern of this should first be made. Then the outline of the wing may be marked on to the wood. The right-hand wing is shown; just reverse your template for the other side.

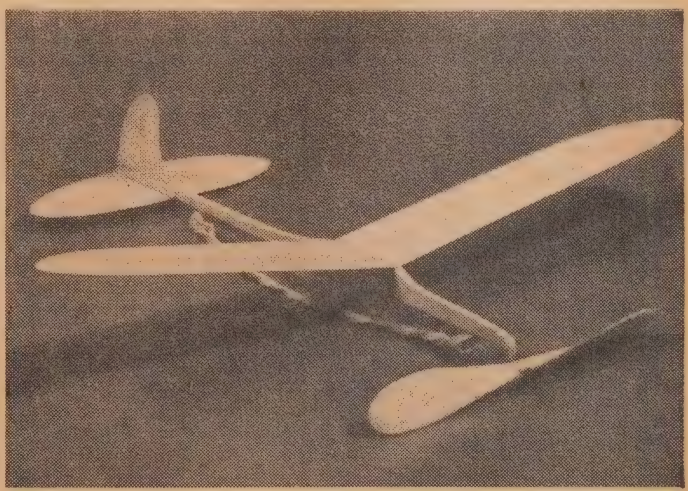
The wing is made in one piece; carefully sand the edges, and sand in the wing section. The bottom surface of the wing is flat, while the top has convex camber. Mark the centre of the wing and when sanding is completed, score the underside with a razor blade exactly across the centre. Crack the wing and raise one tip to create the dihedral angle. Each wing tip is raised 2¼in., which is achieved by keeping one side flat on your working board and raising the other 4½in.

Run cement around the joint and leave the wing to dry.

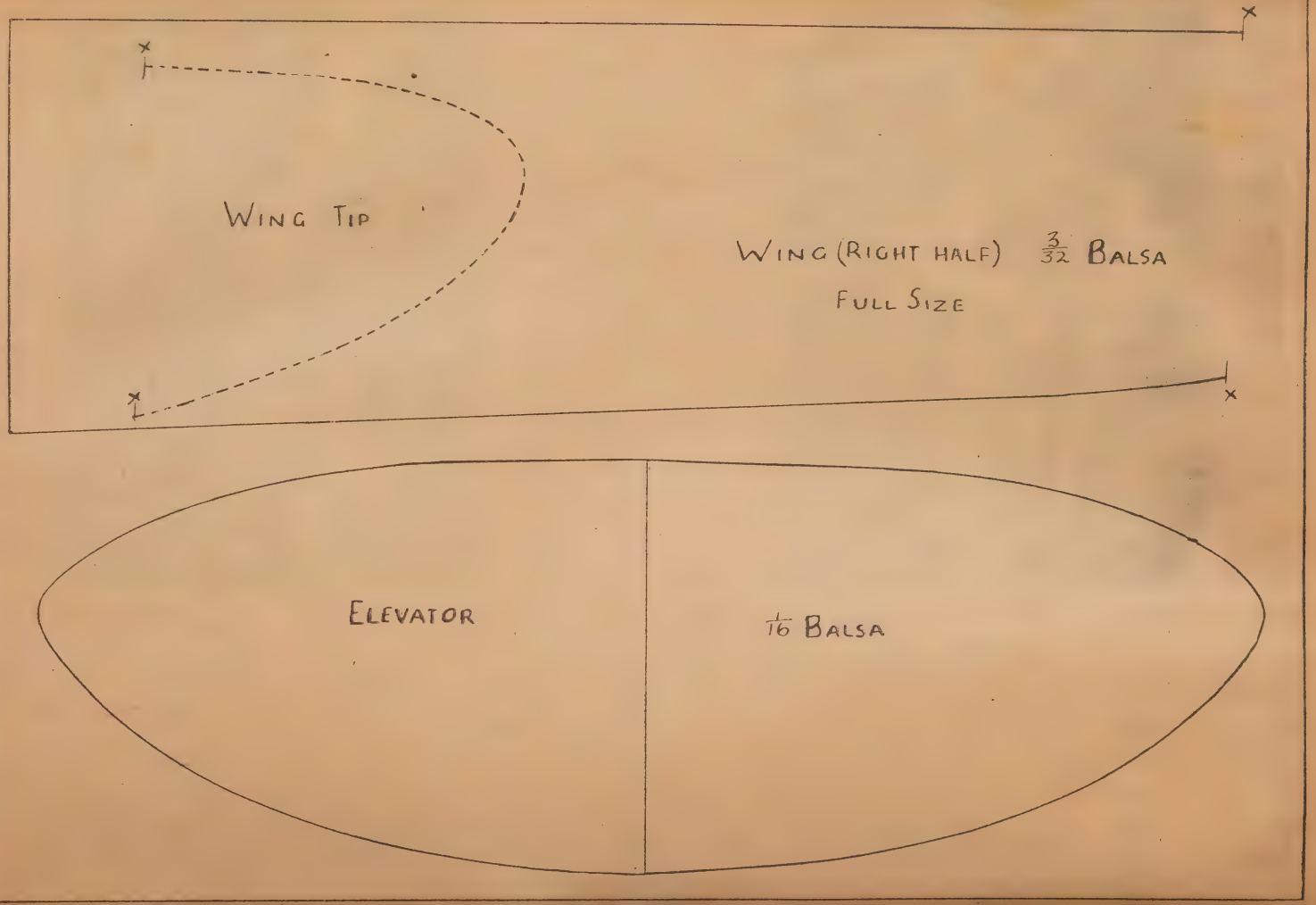
THE FUSELAGE

While the joint is drying, we can start work on the fuselage. It is made from medium light ¼in. wood. The wood needs to be strong enough to withstand the rubber motor and yet light enough to keep the total weight down. Ready to fly, this model should weigh no more than 1oz. The lighter it can be built the better, so long as strength is not sacrificed altogether.

The wood for the fuselage needs to be 19in. long, 1in. wide and ¼in. thick. Here again it simplifies the work if a template is made. Remember that once you have made a template you can build as many copies as you like in a very



And here is the plane itself. Almost exactly like the original, but a good deal larger.


WING TIP
WING (RIGHT HALF) 3/32 BALSA
FULL SIZE
ELEVATOR
1/16 BALSA

short time. Trace the outline on to the wood and cut out to shape.

Note that the wing is not set level but has a 3 degree incidence, that is, the leading edge is 3 degrees higher than the trailing edge. The front of the wing mount is 1-8in. higher than the rear. The elevator fits flush with the bottom of the fuselage, and there it should be left perfectly square to help make a firm joint. Elsewhere the fuselage is smoothed off, all corners being rounded and the rough edges sanded away.

ELEVATOR AND FIN

Cut the elevator and fin to the shape shown and attach to the fuselage; the wood should be 1-16in. thick. Choose soft, pliable 1-16 wood and sand the edges smooth and sharp. Do not leave blunt edges in the airstream. Above all, make sure your tail surfaces are not brittle.

When the tail hook and thrust bearings are attached, the fuselage is completed. Both are cemented, bound with thread and cemented again. The tail hook is made of 20 gauge steel wire. The thrust bearing should be made of 18 gauge aluminium on dural for preference.

This bearing should be double, as shown in the illustration. Lay out the metal, punch the holes; a gramophone needle does this very well, and then bend the arms at right angles. See that the rear hole is 1-16in. above the front. This will point the prop. shaft downwards, giving what is called down-thrust to the propeller.

This down-thrust angle may be varied after model is built by bending one or the other of the arms forward or backward, but we'll come to that when we start to fly the model.

LINING-UP

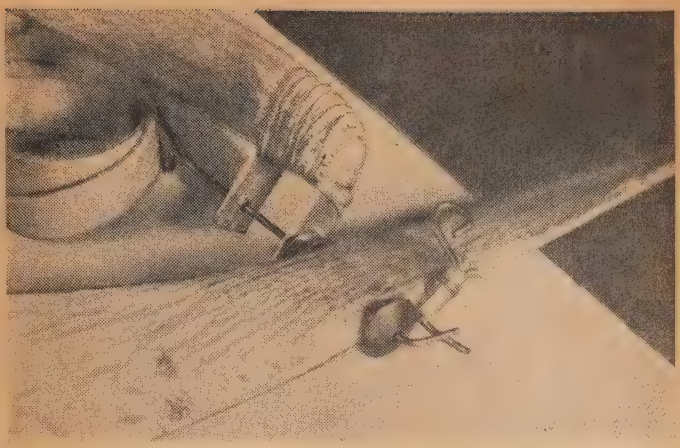
The tail and fin have been cemented into position. Make sure they are perfectly true. Then cement the wing into place. Line up the wing with the tail, so that each side has the same dihedral and make sure the fin is on the true vertical, with the elevator at right angles to it.

Do not use too much cement at this stage and keep in mind that the thinner it is the quicker it dries. Later on several thin coats of cement should be given to each joint; wait for each coat to dry and harden before applying the next, and then leave the whole model several hours before you fly it.

While the cement is drying thoroughly we can get on with the propeller.

The block should be 10½in. long, 1½in. wide and 1in. deep. Lay the block out, as shown in the diagram, and then carve. Always carve away from yourself. Each time carving away the right-hand edge. Work on one side of the blade at a time and carve out the front of both blades before working on the back. The blades are not flat, but should be a little spoon shaped. Carve the blades square and then finish the shaping with sandpaper. The hub is left full depth until after the blades are carved and then cut away, as shown by the dotted line on the drawing.

The chances are that if you are a beginner, you will not make the best job of your first propeller. But, after that, it should be plain sailing.



This fine close-up picture of the free-wheeling propeller will give you all the details you require to make it.

If you do happen to spoil your first propeller, don't be discouraged; the second should turn out all right. Of course, you can buy a propeller or a partly-carved one, but this is not advisable. If you're going to build model planes, you'll have to learn to carve a propeller some time, and it's really quite simple once you acquire the knack.

FREE-WHEELING

The propeller shown has a free wheel which allows the propeller to run after the motor has cut out. This is optional but you'll find that it greatly improves the glide. It is bent from 20 gauge steel wire and fits in a short length of aluminium tubing. The drawings make the construction quite clear, but if you are doubtful about it, you can leave it out. The aluminium tube is cemented firmly to the hub of the propeller and a pin twisted around the tube and forced into the wood will keep it firm.

The prop. shaft is bent from 20 gauge steel wire. Bend the hook first, slip the straight end through the bearing, attach a washer, and then slip on the propeller. Incidentally, the propeller should have a washer glued on either side of the hub to prevent wear and tear where the prop. shaft rubs. This is particularly important if the free wheel is used.

When the propeller is in place, bend the end of the shaft, as shown on the diagram. If you are not using a free wheeler, bend the wire right over and force it back into the hub.

MATERIALS REQUIRED:

1 sheet balsa, 24in. x 3in. x 3½in. medium soft.
1 sheet balsa, 19in. x 1in. x ¼in., light strong.
1 sheet balsa, 14in. x 3in. x 1-16in., soft pliable.
1 block balsa, 10½in. x 1½in. x 1in., medium strong.
20 gauge steel wire.
18 gauge aluminium or dural.
4 feet of ¼in. M.R.L. rubber.
Acetone cement, washers, razor blade, sandpaper.

The power needed is three strands of ¼ flat rubber. Make a loop at each end and attach it to the tail hook and prop. shaft. If you cover your hooks with rubber tubing, you'll save the rubber from cutting.

BALANCING

Before flying test for the glide, the model should balance at the point shown in the photograph. Balance it there by adding weight to the nose or tail. Very little weight will be needed, and, if any, it will probably be needed at the nose. Copper wire bent round the nose or plasticine will do the trick.

When the model balances, test for the glide. It should glide gently and smoothly without any tendency to stall or dive. If there is any fault in the glide, check your alignment. Make sure the tail is perfectly even and flat. It should not warp, being of balsa, but check for this just the same.

Once the model is gliding perfectly, and you may need to alter the nose weight a little to bring this about, it is ready to fly.

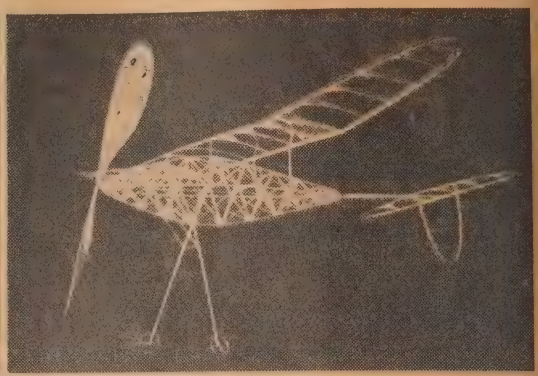
Give a few winds at first and keep increasing with each successive flight. Do not throw the model, launch it on an even keel with just enough speed to start it off.

If the model climbs too steeply and then stalls, add more down-thrust. This is achieved by bending the rear arm of the bearing back a little to increase the downward angle of the shaft.

It is unlikely that there will be too much down-thrust. However, if there is, the model will tend to fly fast and low when under full power. Remove the down-thrust by bending the front of the bearing forward a little.

After the trials are satisfactory, pack on the turns. If you use a hand drill for winding, stretch out the rubber from the tail. The model should take on 600 or 800 turns maximium and, with this power, you can be prepared for some first-class duration.

THE ART OF INDOOR MODEL FLYING



This plane won the indoor National Championship of America last year. A cabin model was specified in this section of the contest. Note the almost unbelievable fragility of the construction and the use of micro-film for covering. The chassis is so fragile that the motor must be wound out of the plane and later placed in position.

At West's Olympia, on Sunday, February 11th, the M.A.A. will conduct the N.S.W. Indoor Championship for model planes. If you have never seen this fascinating side of model flying, you are certain of some surprises. These marvellous planes are so light and fragile that they would probably collapse if flown at much more than a walking pace!

TO the average person, the idea of flying model planes indoors may not mean much, but to the model builder, it conjures up visions of hours of tedious exacting work, and heart-breaking crashes, and yet for all that, it is one of the most fascinating branches of the sport.

30 INCHES—1/10th OZ!

The idea of building a model of 30-inch wing span, so light that it weighs less than 1-10oz., may seem fantastic, but it is regularly done. Indeed, American experts have constructed small models round about one foot span, equipped with undercarriage and rubber motor, which weigh ready to fly, about .029oz., or roughly, 1-30oz.

At West's Olympia Theatre, on Sunday morning, February 11, 1940, the M.A.A. will conduct the N.S.W. Indoor Championship and there you'll see these models in action.

MICRO-FILM

The secret of this lightweight construction is a substance called microfilm. Of course, super-light balsa wood plays its part, but this microfilm, a gossamer light cellulose film, which is used to cover the model, adds practically no weight to the model. To the average person it would appear to have no weight at all, but the indoor modeller talks about light and heavy microfilm, and is careful to use the very light film on his tail surfaces, saving the heavier for the wing.

The expert tells the weight of this film by the color of the light which it reflects. You must have seen kerosene spread out over water and reflect many different colors. Microfilm is somewhere about the thickness of kerosene film and the very thin grades reflect a golden-copper color, while the heavier grades reflect bluer shades. Of course, the film is completely transparent and has to be moved around in the light before the colors can be seen. Clear film, which does not reflect any color, is regarded as much too heavy for normal use.

This microfilm is prepared in a most interesting manner. First the solution has to be prepared. Collodion is used as a base and some plasticising agent is necessary. Castor oil is as good as anything for this purpose.

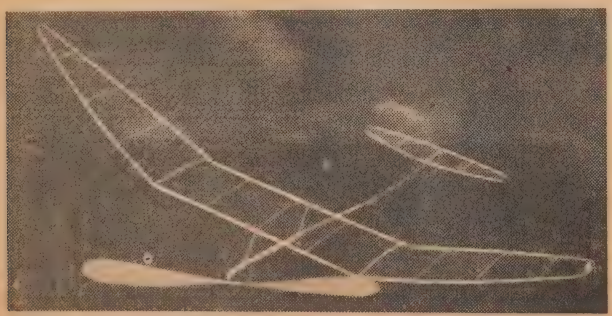
The film is prepared by pouring the solution onto still water. The solution spreads out, hardens and can be lifted from the water with a hoop or frame made for the purpose. The quantities of the constituents of the solution are varied until a satisfactory film is obtained.

Wire hoops are generally used for lifting the film and the film-covered hoops are hung up for the film to dry and harden, ready for use.

The whole process of making and lifting the film calls for a great deal of skill and lots of practice. Many sheets are ruined in the process before the builder becomes expert.

The difficulty of making the film is more than equalled by the job of getting the film on to the model framework. Saliva or water is used as an adhesive and the edges of the film are trimmed with a stick dipped in acetone or a very thin solution of acetone cement.

The construction of the framework



A typical stick model "pusher." The tail and inverted rudder lead the way in this type. The wing is raised up from the "stick" fuselage.

is not difficult, but calls for a great deal of patience. Design has become standardised. The average contest model is round 24 inches or 30 inches spread and construction is reduced to a minimum. Single surfaced wings attached to a motor stick and a very elementary tail, make up the standard model.

Wing spars usually taper from 1-16in. down to 1-32 or 1-64in., and the motor stick is built up hollow from 1-64in. sheet balsa.

FEATHERWEIGHT "PROPS"

Propellers are indeed featherweight. First class balsa is sanded down to paper thinness. The blades are so thin that light passes through them easily, and the final sanding is gauged by the amount of light passing through blades.

It would be quite impossible to wind these propellers by hand. Fairly highly-geared winders are necessary, since the turns usually run around the 1500 mark. This enables the model to fly some 12 minutes, depending on the conditions and the size of the hall.

The propeller revolves so slowly that the blades can almost be seen, the general speed is 100 revs per minute.

GREAT CARE REQUIRED

Naturally these models must be handled and flown with extreme care. There is an impressive majesty about the flight of an indoor model, everything seems so deliberate, and, indeed, everything depends on the ability of the flier. There are no up currents to assist, or sudden gusts of wind to disturb the model.

The local builders have achieved a great deal of success, but are handicapped by the size of the halls available for contests.

BIG HANGARS USED

In America, airship hangars as high as 180 feet, are used, however, we have to fly in picture theatres, which are at most 60 feet high. This has, of course, influenced design. The local models have to be low-ceiling models. They climb very slowly and come down more slowly still, for all that it is a very rare model that doesn't spend one or two minutes scraping around the roof.

The present Australian record for indoor models is held by Vernon Grey, of New Zealand, whose model recorded 11min. 23sec. in the Sydney Town Hall, during the 1938 Australian championships.

There is every possibility of this time being eclipsed on Sunday, February 11, where the best indoor fliers in the State will be seen in action.

NEW PARIS STATION

WHAT appears to be another outlet of the new French transmitters is a station on 9625kc., 31.9m., which was giving the programme of Paris Mondial. It has been heard on two or three occasions from around 6.30 a.m. until after 7.0 a.m., but, so far, has only been very weak.

HOW TO ADJUST YOUR RUBBER MODELS

The days of trial and error are largely disappearing from model flying history. To get the amazing performances put up by the models of to-day, one must have more than a passing knowledge of how the thing is done. In this article, Australia's No. 1 model flyer gives you the "low-down" on how it is done!

By Jim Fullarton.

IT is an accepted fact among the model flying fraternity that almost anyone can build a model, but that it takes an expert to fly one. No matter how well designed a model may be, it is most unlikely that it will fly correctly straight off the drawing board. Usually, flight tests indicate minor adjustments to the thrust line, wing position, angles of incidence and rudder settings, which must be made before the model consistenly gives its maximum performance as intended by the builder.

ADJUSTING, AN ART

The adjusting of a model, especially the modern high-powered weight-rule type, is definitely an art, acquired only after considerable experience, and in this article we can only indicate the lines along which to work, and leave the reader to find out for himself, by trial and error, just how much of each adjustment is required.

To start with, no amount of adjusting can make a consistent flyer out of a model whose basic design does not incorporate sufficient inherent stability.

As a guide to what is necessary to fulfil this requirement we give a typical arrangement as is used on weight-rule fuselage models. The wing is of the parasol type—that is, it is raised, either on a cabin or mounting, a distance of about 2-3 the chord above the line of the rubber motor. It has tip dihedral or polyhedral, so that each tip is raised 1¼in. for each foot of span. For example, a wing-span of 36in. would have tip raised 3¾in. above horizontal.

THE WING SET

The wing is set at 3 degrees positive incidence. This is measured relative to some datum line, say, the centre line of the fuselage. The stabilizer, which should be about 40 per cent. of the wing area, has a low lift section such as an M5 or M6 or a thin clark Y, and is set at zero incidence.

A model with a stabilizer of high-lift section is practically unflyable. The rudder area can be taken as 12½ per cent. of the wing area. The bearing in the noseblock is set to give the propeller shaft 2 degrees of downthrust and a slight amount of right thrust.

The model must be constructed with sufficient accuracy to ensure that these settings are as specified, as it is difficult to check them on the completed job.

NO WARPS ALLOWED

Also, there must be no warps in the flying surfaces, and the wing and tail group should be in perfect alignment.

With everything complete and assembled, the wing is placed in position so that the model balances with the fuselage level when supported in the centre of the chord at the centre section, not at the tips.

You are now ready for gliding tests. Pick a grassy slope and a slight breeze, and launch into the wind, nose pointing slightly downwards with sufficient push to develop full flying speed. If it noses up and stalls, then drops, try moving the wing back a little at a time.

If this adjustment fails, try a little positive incidence in the stabilizer. If, on the other hand, it fails to lift and glides steeply into the ground, move the wing forward or give the stabilizer some negative incidence. When you are getting straight glides, as flat as possible without stalling, set the rudder to give a wide right circle, and be sure the model shows no signs of slipping to the right.

POWER FLYING

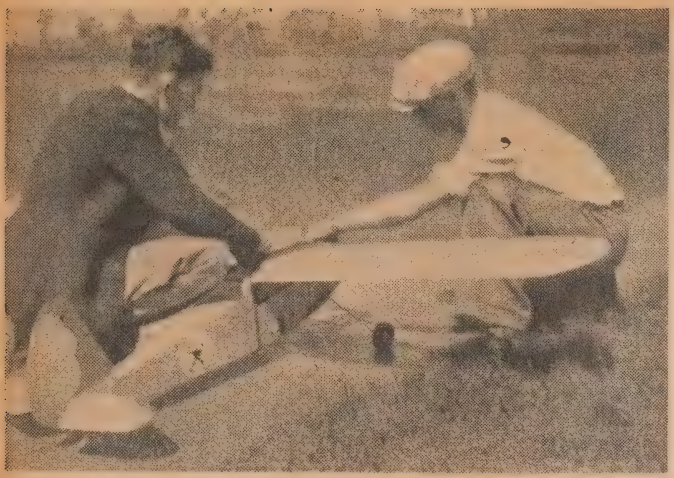
The next stage is power flying on half-turns. For this, anything but calm weather makes testing extremely hazardous. Wind several hundreds turns in and hand-launch as before. A steady climb in wide circles to the right should ensue. The most common fault here is a stalling tendency.

This is cured by increasing the downthrust slightly. The correct right circle is most important. With a right-handed airscrew there is a strong torque reaction, tending to roll the model to the left, so that the rudder must be set to the right to counteract this. On no account should the model be allowed to fly straight, as this reduces its chances of catching the elusive thermal. On the other hand, the circle must not be too tight, or you may experience the dread spiral dive.

So far, there should have been no serious troubles, and you can start increasing the number of turns up to the maximum. If, owing to torque reaction, the model refuses to turn to the right, increase the side thrust very slightly,

Continued on Page 73)

Photos By
JOHN CAVILL and
IRWIN FROST



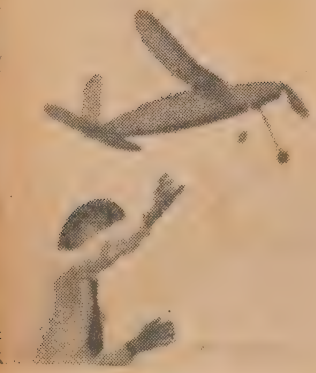
WILL SHE START? Bill Marshall, of Hunter's Hill, cranks his motor, while Cyril Lucas, of Drummoyne, holds the model. Note the runway necessary because of the rough ground.

GOOD FLYING AT WYONG

The recent model flying meet at Wyong was well attended by enthusiasts from Sydney, Newcastle, and of course, Wyong and district. Some grand flying was seen, and everybody enjoyed the day. More meetings in country districts would do much to popularise model flying throughout the State.

A PERFECT LAUNCH! This is how the job should be done. Alan Brown shows you how. Alan is yet another veteran flier who has returned to the Association.

ACE IN ACTION! Jim Fullarton, Australian champion and ace model builder, assists A. G. Hull's Zipper into the air in the petrol-driven contest.



UP SHE GOES! John French, of Chatswood, launches his model in the Open Event. This model placed John second in the recent Australian Championship.

HIGHLIGHTS OF WYONG COMPETITION

The close of 1939 saw the beginning of a new and enthusiastic model plane club at Wyong. Judging from the results of its first meeting, we may expect to hear great things from up north before very long.

MAINLY due to the efforts of Phil Levenspiel, a series of open contests were arranged for December 17. The majority of Sydney model flyers, several Newcastle men, and Irwin Frost, who travelled from Goulburn, came to take part in the contests.

The flying field was just out of the township, a large open field that made an ideal venue for the contests.

Flying commenced at about 11 a.m., the open hand-launched contest, and R.O.G. petrol-powered contest, being conducted simultaneously.

Flying on a 20sec. motor run, Ted Baker, of Mosman, set up 1min. 43sec. and held the lead for the greater part of the morning.

In the open rubber-powered contest, Harry McKay jun., of Mosman, was first to set up good time, when his model flew away after 5min. 36sec.

UNUSUAL CONDITIONS

The weather conditions on this day were most unusual. A calm north-easter blew across the field and conditions were perfect. Yet on the western horizon, a huge bank of black clouds was massed, lit up by intermittent flashes of lightning. The thunder from this storm echoed across the field, but for the greater part of the morning flying proceeded uninterrupted.

Many flyers were waiting for the approach of the storm before sending their models away, hoping thereby to take advantage of the rising front, which always precedes thunderstorms.

A GOOD FLIGHT

Arthur Goard, of Chatswood, sent his rubber-powered model aloft just as the north-easter dropped. The model climbed in comparatively still air, and was almost immediately caught up in the "riser," which sent it rocketing upwards to disappear after 9min. 34sec. The flight was a tribute to Arthur's judgment. He waited the better part of the morning for the conditions which finally won the contest for him.

His time was not challenged, with the exception of a fine flight by Arthur Butler, later in the day. However by that time the storm had cleared and the model was quickly carried out of sight by the freshening north-easter. The time was 7min. 56sec., and was sufficient to place him second.

HAND LAUNCHED GLIDERS

The storm brought heavy rain, which did not last very long. Immediately conditions had cleared, the open hand-launched glider contest was staged.

Each competitor was allowed four flights and, as the entries had been divided into groups, many gliders were in the air at the one time. Despite this, there was no confusion in running the contest, nor had the spectators any difficulty in following it.

MERV. WILLMAN WINS

John French (Chatswood). was the first to set up a really good time, when his model stayed up for 47sec. Mr. Chapman (Wyong) added 4-5sec. to this time, to take the lead, but finally, he too, was beaten.

The winner was Merv. Willman, of the Aerobats. Merv. had been flying well during the morning, on one occasion he almost lost the model, but it landed after a flight of well over 2min. In the contest, Willman set up 1min. 6sec. and ran out an easy winner, with Irwin Frost (Goulburn) in second place, with a flight of 55 1-5sec.

WYONG MEMBERS ONLY

At the conclusion of this contest, the Wyong Glider Contest was conducted. This was restricted to members of the Wyong Club, and was won by Mr. O. Chapman, with 29 1-5sec. For a new club, Wyong has a particularly enthusiastic membership and shows a great deal of promise. It should not be long before some of these Wyong lads capture some of the Association's records.

HOW TO ADJUST YOUR RUBBER MODELS

(Continued from Page 70)

as this is a very powerful adjustment. If the flight is fast and low, reduce the downthrust or, better, increase the wing incidence.

By this time you should be making R.O.G. flights. For a full-power take-off, place on the runway with the wind under the left wing-tip slightly, to counteract the torque reaction. Hold the airscrew with the left hand, and the left wing tip with the other, let everything go—and hope.

Another point to remember is that setting the rudder to the right has the effect of holding the nose down, so that a model which tends to climb straight up and stall may be cured by persuading it to circle.

Incidentally, in referring to the right-hand side or left-hand side throughout this article, the view is taken from the rear, looking forward. In summing-up, the following points are outstanding: Make all adjustments very gradually, and never try more than one alteration at a time. Work up progressively and gradually from gliding to full-power flight. Finally, the surest method of winning contests is to have the right model completed, tested, and ready in every detail at least a week beforehand.

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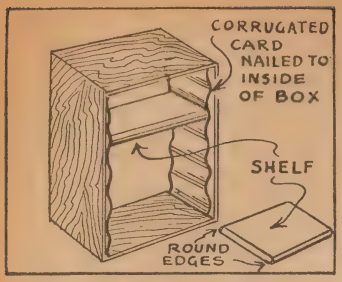
By Walter G. Nichols



A NOVEL CABINET

A SIMPLE cabinet for holding odds and ends may be made from a small box and a quantity of corrugated cardboard, such as is used for packing fragile objects. The cardboard is glued or nailed to the inside sides of the box. Light shelves with rounded edges may then be slipped into the corrugations. Obviously, they may be adjusted as required.

SCHOOLBOY HOWLERS

Herrings travel in the sea in shawls

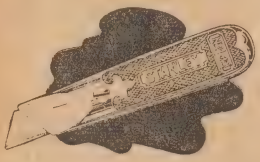
Cereals are stories that last several weeks.

A centimetre is an insect with a hundred legs.

An oculist is a species of spider fish

Barbarians are things that make bicycles run smoothly.

STANLEY FIBRE BOARD KNIFE



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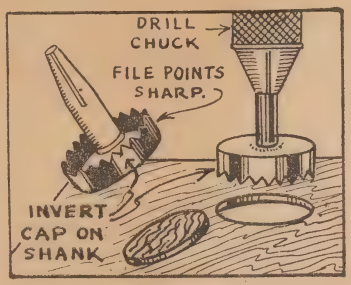

NOVEL CIRCLE CUTTER

OFTEN one has occasion to drill a hole for which a suitable bit is not available, or which is too large for the average size. A handy circle cutter can be made from an old castor socket. The cap is removed first of all, and inverted in the shank. The teeth should then be filed to a keen cutting edge. To use the cutter, insert the shank in the chuck of the drill. A steady, even pressure should be employed, and a clean hole will result.

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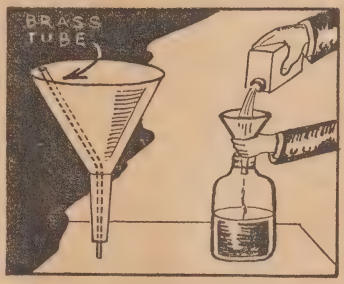
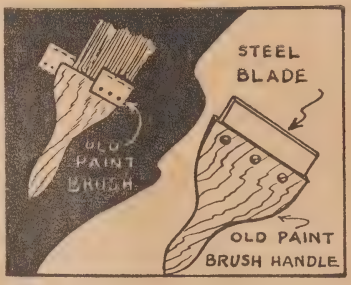


THIS FUNNEL WON'T OVERFLOW

WHEN liquids are poured into a narrow-necked container, there is always trouble caused by the funnel preventing air from escaping from the bottle, thus making the liquid overflow. To avoid this, solder a length of brass or copper tubing to the inside of the funnel, as indicated in the sketch. The tubing will allow the air being displaced by liquid to find an easy way out. You will find this funnel invaluable.

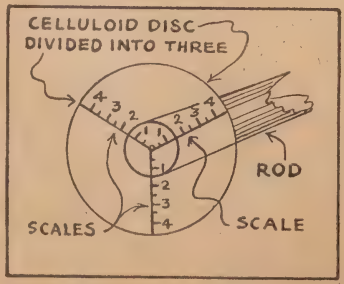
• • •



A PAINT SCRAPER

IF you have a metal or wood paint scraper, you will know from experience how hard it is on the hands, if not fitted with a good, comfortable handle. An excellent handle can be made from an old paint brush, as shown in the sketch. The bristles are removed, also the metal strap. The scraper is inserted in a slot cut in the handle, and small bolts hold the scraper together.

• • •



CENTRE LOCATOR

A VERY useful instrument can be simply constructed for finding the centres of rods or circles. From a piece of celluloid, cut a circle, and divide it into three equal sections. Along these dividing lines, mark off sections of equal length, and number them as indicated in the sketch. To use the instrument, place over the end of the article to be measured, and move it about till the edges show the same reading. A small hole pierced in the centre of the disc permits the object to be centre-punched.

HOME-MADE EXPONENTIAL HORN

(Continued from Page 15)

When the sides are laid out in the above manner, be sure that one side is the exact reverse of the other. When the grooves are finished, lay out and drill nail holes in the manner before described. Beginning with the "top section," glue and nail pieces Nos. 2, 3, 4, 5, and 6 in place. The result will be a rather odd-looking "bookcase" affair.

In the top of the "top section," just over the speaker cavity, is a 1-inch hole to permit passage of the speaker plug and cable. There is another in the back of the finished cabinet for the same purpose. By this arrangement, the cavity between the top of the "top section" and the top of the cabinet serves as a damper against loss of air pressure through the speaker-cable hole in the horn.

The front, back, top, and bottom can then be put in place in the order mentioned. By the time you get this far, this latter job will seem comparatively easy.

The speaker opening and the mouth of the horn can be covered with grilles and cloth, or just pieces of bronze fly-screen with simple frames, according to the inclination of the builder. No great detail will be given as to how the speaker is to be mounted for the reason that the outside dimensions of various makes of 8-inch dynamic speakers are not always the same.

In some cases the speaker can be mounted directly on the grille, and for others, where the speaker is a bit larger than the opening provided in the cabinet, the outside rim of the speaker can be attached to the outside of the horn. Such details as the above and the cabinet finishing are left up to the individual taste.

The dynamic speaker must be of good quality, and it should have a cone central angle of around 90 degrees. Speakers with flatter cones are not able to work against the air-column load without buckling; though the buckling is not audible, the bass is just left out.

GENERAL

The results obtained with this horn were more than gratifying. In the first place, the receiver listed among the family properties has only a single 6F6 audio output, but it is capable of furnishing all the volume that a home or a small auditorium can stand. In fact, the efficiency of the dynamic speaker seems to have been raised considerably, and it is no trouble at all to rattle the windows in the room without running the audio up to the distortion point.

This was not possible with the same dynamic speaker on a 3-foot square baffle that was used before the horn was made. The base response is very good, and there are no indications of cabinet or speaker resonance. With normal volume, the throb of a bass drum or bass fiddle is sufficient to vibrate the floor without giving the impression that it is being forced.

A HANDY POWER SUPPLY

(Continued from Page 39)

high tension voltage rising about 20 to 50 volts, according to current drain.

OUTLET

The safest form of outlet for the voltages is a valve socket. We do not recommend the use of bare terminals mounted on strips, or any other method which allows bare connecting terminals or plugs.

Safety first should be observed with any power supply, and the valve socket type of outlet makes the job shockproof when in position.

A six-pin socket is handy, and we suggest the connections shown in our diagrams.

USES

It is our hope to detail several amplifiers and receivers suitable for operation from a power supply of this type. The original unit is standing on the test bench in our laboratory and will be used extensively for experimental purposes from now on.

We hope to describe a simple amplifier consisting of a triode audio amplifier driving a single 6A3, then a 32-watt amplifier with beam power valves and inverse feedback, then to change over to triodes in the output and to try out several types of drivers and audio amplifiers. All of these experiments will be covered in "Radio and Hobbies," and each of the amplifiers will be designed to operate from this power supply unit.

We can, therefore, recommend experimenters to build up a similar unit if they intend to follow us through with the amplifier and tuner experiments as contemplated.

R.C.S. APPOINTMENT

THE new R.C.S. 1940 catalogue is now ready for distribution. The introduction of Trolitul a year ago has been a very large contributing factor to the heavy increase of their business during the past 12 months.

This has necessitated increasing their store facilities, so that a stock of every line produced can be built up, from which immediate delivery can be made.

Also, the sales organisation is being augmented by the appointment of Mr. R. K. Stokes as a factory representative. This appointment does not affect the existing sales organisation, and Mr. F. E. Wodell, sales manager, will continue to do his usual round of the trade.

LISTEN FOR THESE

(Continued from Page 59)

ZHJ.—6080kc., 49.3m., Penang, S.S., On some nights this station is much better than others, but usually good. (Foster, Lee, Medina, Gaden.)

ZBW3.—9525kc., 31.5m., Hongkong. This British owned station is still coming in well every night. (Lee, Foster, K.Mc., Medina, Gaden.)

XYZ.—6007kc.,49.94m., Rangoon, Burma. Only heard very weakly now, and not as strong as the new transmitter.

——.—6056kc., 49.54m., Rangoon, Burma. This is the new Rangoon transmitter, which is now heard so well.

XGOX.—15,200kc., 19.74m., Szechwan, China. Has been heard well at midday and also around 5.30 p.m. (Lee, K.Mc., Medina, Gaden, Clack, Foster.)

XGOY.—11,900kc., 25.21m., same location. In the early morning is weak but very good at 9 p.m. (Lee, Silverthorne, K.Mc., Foster, Medina, Clack, Gaden.)

XGSE.—9840kc., 30.47m., China. This is the new station mentioned in article opening at 10 p.m. Not definite about call letters.

XGOK.—11,650kc., 25.75m., Canton, China. Fair strength at 10.30 p.m. News in English at 11.15 p.m. (Lee, K.Mc., Gaden, Foster.)

XPSA.—7010kc., 42.8m., Kweiyang. This Chinese station is not as loud as it was a few weeks ago. (Medina, Foster, Gaden, Lee, Clack.)

XMHA.—11,855kc., 25.3m., Shanghai. Only fair strength now, and not as strong as formerly. News at 10.30 p.m. (Foster, K.Mc., Medina, Clack, Battis, Gaden.)

XTC.—9295kc., 32.28m., same location. Another Shanghai station which has weakened a good deal.

XGAP.—9560kc., 31.38m., Peking. This station is only heard in the very early morning, and is very weak. (Medina.)

An Electric Fence

(Continued from Page 42)

A protecting case for the completed fence control is shown in Fig 5. The four sides and the bottom of the case may be of light metal. The top is of light wood or other non-conductor. Holes are cut in the top and end of the box to allow the pendulum and adjustment knob to protrude. When leading the wires through the metal case, the insulation on the wires must be increased to the thickness of a lead pencil by wrapping tape around them for about 1in. on each side of the metal.

To operate the control, close the switch (13) (see Fig. 3) and adjust the knob "A" until the pendulum will swing at the proper speed. It will be necessary to give the pendulum a start with the fingers until the proper adjustment is found. Thereafter it will usually start by itself. It may be necessary to touch up points occasionally with regular point file to ensure best results.

ANSWERS TO CORRESPONDENTS

UNDER THE PERSONAL SUPERVISION OF THE EDITOR

HOW MANY METRES?

ONE question which comes up in our mail time and time again is, "How many metres are there in a kilocycle?" or words to that effect.

The relationship between metres and kilocycles is very simple. Actually, they represent two ways of saying the same thing. Remembering that we think of radio waves travelling through space something like waves on the sea, the distance between the crests of successive waves is expressed in metres. As the waves all travel at the same speed (300,000 metres per second), the further apart the waves are, the fewer will pass a given point in any one second. That is why a station on, say, 300 metres, has a frequency of .1000 kilocycles per second, while one of only 30 metres has a frequency of 10,000kc. per second.

To find out how many kilocycles per second for any station of a known wavelength, we divide the number of metres into 300,000. Similarly, to find metres from kilocycles, we do the same thing. The number of metres, multiplied by the number of kilocycles thus will always make up 300,000, the speed in metres at which all radio waves travel each second.

W.M.L. (West Kogarah).—Since your set is an old one, it is quite likely that some of the condensers or resistors in the detector circuit have just worn out. We suggest that you test these parts or have a competent radio man check them for you.

L.S.C. (Advancetown).—Many thanks for the circuit of the car radio. We may be able to do something with this at a later date. Glad you like the paper so much.

J.F. (Orange).—Your idea interests us very much. If you think that you could trust us with further details of your secret device, we would be pleased to test it for you.

D.F.L. (Caulfield).—Although you differ from our opinion that the word "Ham" is an abbreviation of the word Amateur, we still maintain that our interpretation is correct, and not as you say, that "Ham" was the name of an amateur fan in America. Full constructional details of the coils for the Duplex Single are described in the Christmas issue of "Radio and Hobbies," which may be obtained by sending sixpence in stamps to this office.

E.McN. (Carwarp) wants a small amplifier circuit to be used as a deaf aid.

A.—Although up to the present we have had very few inquiries for a set as you mention, we are giving it our serious consideration and hope in the near future to describe such an amplifier.

R.W.B. (Marree).—Sorry, but we are unable to give you any information on this transmitter. As all amateur activities have been suspended for the duration of the war, we would strongly advise you to forget about it. It is illegal at the moment to have any kind of transmitter on your premises, irrespective of its size.

T.M.G. (Rockhampton).—Your suggestion is quite a sound one, and in an early issue of "Radio and Hobbies" we will print a complete list of resistor values, with their corresponding colour code. Glad you like the paper.

J.R.M. (Jedburgh Station).—Many thanks for your nice letter. We are glad that you like "Radio and Hobbies" so much. You were quite lucky that you were able to locate and adjust the fault in the house lighting system and the vibrator receiver as easily as you did. We should be very pleased to know how the "Economy Seven" performs in Western Queensland.

A.W. (Mont Albert) wants us to describe a portable set for use with A.C. mains.

A.—Your suggestion is quite good, as we understand that several portable sets are now being marketed with an attachment that allows them to be connected to A.C. lines. However, as these sets are quite tricky to build, we will not describe one in "Radio and Hobbies" until we are satisfied that it will be quite reliable and satisfactory in operation. We may be able to do something about a set of this type in some future issue.

J.E.G. (Murrumburrah) wants to know whether he can use a filament transformer and an eliminator on the Duplex Single.

A.—Since the valve in the Duplex Single is a battery valve, it is necessary to heat its filament with D.C. Thus, a filament transformer supplying A.C. would not be suitable. The eliminator would be quite O.K. to use, providing the voltages were suitable.

A.M. (Bundaberg).—Sorry, we can't answer letter by mail. The two-volt vibrators that you mention are made by R.C.S. Radio Pty. Ltd., Glebe-street, Glebe, Sydney, who will advise you of their price if you write direct to them. We understand that these vibrators are quite O.K.

YOUR QUERY ANSWERED FOR A SHILLING!

In response to many requests, we have decided to re-introduce the Shilling Postal Query Service. This means that if you want your queries answered by mail, send 1/- Postal Note or Stamps, and you will receive your reply within a few days.

The fact that Radio and Hobbies is published monthly means that without such a service, urgent queries could not be answered, possibly for several weeks, through the columns of the paper.

Make your questions as clear as possible, and if you can, group them together at the end of your letter. This makes it much easier for us to answer them.

If you send a Postal Note, make it payable to "Radio and Hobbies." Our address is 60-70 Elizabeth-st., Sydney.

USE THE MAIL FOR QUICK REPLY SERVICE

"1.4 Portable" (Grafton).—The 1G6G is the 1.4-volt equivalent to the type 19. As far as we know, this valve is now obtainable on the Australian market.

H.I. (Charters Towers).—As the fixed condensers and resistors are so cheap to buy and give satisfactory results, there is nothing to be gained in describing how to make them. The Pentagrid Three described in the December issu of "Radio and Hobbies" seems to be just the set you require, and if necessary could be adapted to cover the short-wave band. We may be able to run a series of articles at a later date on batteries, cells, &c.

M.E. (Cairns).—The Pentagrid Three described in December issue of "Radio and Hobbies" should suit your purpose, as it is an excellent performer on the broadcast band. It could probably be adapted as a dual-wave receiver, but as we have never tried this out, are unable to give you any advice on it.

V.B. (Canterbury) wants articles on chemistry.

A.—At the moment, we are unable to include any articles on chemistry in "Radio and Hobbies" owing to lack of space. However, at a later date, if there is enough demand for this type of article, we might be able to have a section devoted to this subject. Glad you like the paper.

W.R. (Mackay).—It is not necessary to insulate the potentiometer from the chassis in the two-valve set.

R.C. (Maclean) wants "Radio and Hobbies" devoted more to beginners.

A.—The present policy of "Radio and Hobbies" is to cater for readers of all ages. Under the present conditions the beginner is usually well looked after each month. We do not know whether the firm that you mention has any agency in Australia.

N.P. (Mackay) is very enthusiastic about the "Stereoscopic Seven," which he has just completed. Thanks for your very nice letter, and we wish you every success with your set.

"Country Reader"—Sorry, but as there is little demand for D.C. receivers these days, and as most of the districts supplied with D.C. are being changed to A.C., it would hardly be worth while designing such a set.

R.A.B. (Marrabel).—The letters T.R.F. stand for "Tuned Radio Frequency." We will bear your suggestion in mind when preparing future sets. Glad you like the paper.

J.M.A. (Hobart) and W.K.C. (Peterborough).—Since we have never attempted to rewind such generators, we would only be guessing if we tried to advise in this matter. Perhaps one of the large booksellers may have books on this subject.

G.S.B. (Pennant Hills).—Since you have never built a set before, it is difficult to advise you, but Tiny Tim, a small three-valve set described in the September issue of "Radio and Hobbies," should not prove too hard for you if the instructions are carefully followed. The price of the complete kit of parts can be obtained by writing to any of the radio dealers advertising in "Radio and Hobbies."

W.F. (Maroubra).—Many thanks for your suggestions. We may be able to use them for future articles. However, we do not think there would be much demand for a D.C. set. Also there is an element of danger attached to building these sets unless one is an expert.

"Frisco Rudy" (North Tambourine).—The telephone system as described in the May issue of "Radio and Hobbies" would be quite suitable for your purpose. The switches three and five can be left out if it is not desired to send or receive code. Should you meet any difficulty with this apparatus, you could write to Mr. Black, c/o "Radio and Hobbies."

J.F.L. (Brisbane).—There are no restrictions on building and selling radio sets, except that all the sets that you build for sale must have licence plates attached to the chassis.

R.S.W. (Willoughby).—The set that we tested was one of Philip's latest mantel model sets.

J.D.P. (Langhorns Creek).—It is quite true that when two metals such as copper and iron are joined together and their junction point is heated, a flow of electricity can be detected. To explain why this current flows would take up too much space in this column, but we hope to have an article prepared on this subject which should prove quite interesting to many readers.

A.R.H. (Enfield).—Glad your first set turned out quite successful. As you have eliminated the hum from the set, it is better to leave it as it is now, although probably the hum was due to the grid leak and condenser not being shielded. There is not much you can do to make it more selective, as it is not designed to separate every station.

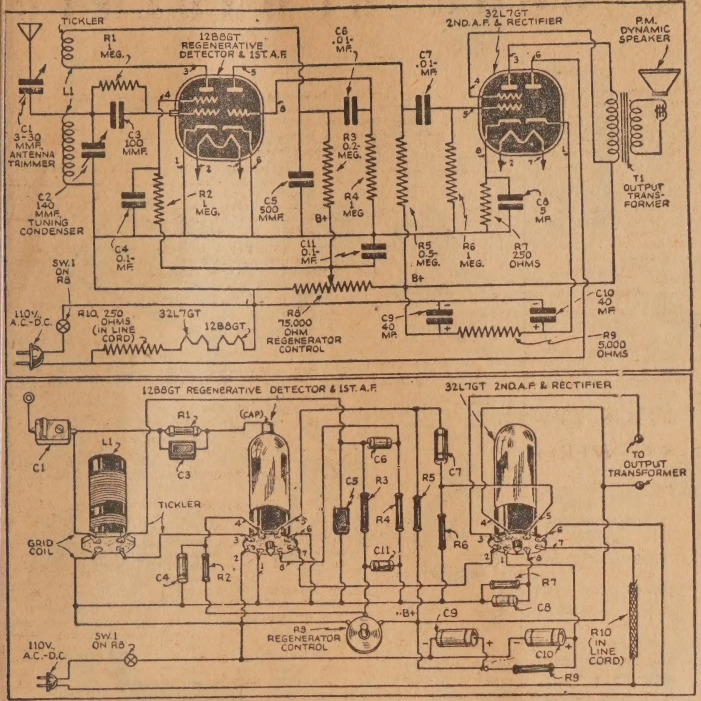
C.B. (Marrickville).—From the information contained in your letter, it is almost impossible to say what the fault is likely to be. Suggest you see a competent service man or refer the set to the person who sold it to you.

A.H.K. (Degilbo) asks some questions on the Duplex Single.

A.—All the details for making the coils for the Duplex Single are included in the article in the Christmas issue of "Radio and Hobbies." We would not advise you to change the transformer coupling to resistance coupling, as it is not likely to give satisfactory results. Incidentally, good audio transformers are not so dear to buy, and will improve the set out of sight. Thanks for your good wishes.

H.I. (Scott's Flat).—The circuit would be better if a screen grid tube was used instead of the triode. Yes, the portable set, employing condenser reaction and having a regenerative detector, should function quite satisfactorily. An iron chassis would make no difference to the short-waves coils on the Duplex Single. As resistors are quite cheap, it might be advis-

A BABY A.C. PORTABLE SET



This is how an enterprising American experimenter made up a simple portable set A.C. operated. The circuit as it stands is not directly suitable for 240 A.C., but some of our readers might care to try adapting it for their own use. A power transformer should be used. We have a few ideas in mind for another small set of this type, to be released in the near future.

able to fit a new grid leak to the set, since the old one has seen plenty of work. Many thanks for the sketch of the speaker that you are using.

W.G. (Nth. Melbourne).—Sorry, but owing to the technical difficulties involved, it would be quite impossible to give you the information that you require on building the refrigerator.

F.P. (Macksville).—Many thanks for your kind letter, and glad to hear that you have built the Advance Dual Wave set with so much success. It's certainly a great performer.

The Earl (Stanmore).—Although we could give several suggestions about your set, none of them might cure the trouble. Your best plan would be to take the set to some competent service man. Thanks for your kind remarks.

C.B.T. (Baratta Station).—"Radio and Hobbies" publish each month lists of short-wave stations, and as this section is constantly being kept up-to-date with the addition of new stations, no better guide could be had.

V.H. (Annandale), V.J.G. (Chinchilla) would like a binder to be made available for "Radio and Hobbies."

A.: If we thought that there would be enough readers interested in buying a binder, it might be possible to make one available. Let us have your opinion on this matter. Glad you think that "Radio and Hobbies" is the best paper.

C.K. (Brisbane).—The circuit you propose should work the small loud speaker quite well, and the set, if carefully constructed, should give you good results. We appreciate your kind remarks about the paper.

J.R.R. (Punchbowl).—As the coil used in "Little Jim's Mate" was a commercial product, we are unable to give you winding data. These coils are cheap enough to buy, and it is hardly worth your while trying to make one.

H.J.G. (Mt. Sawby) wants constructional details of Electric Guitar.

A.—The information in the October issue of "Radio and Hobbies" was supplied by Radio Equipment Pty. Ltd. and we suggest you write to this firm, who will gladly supply you with any information they can.

R.W.P. (South Australia).—From the remarks in your letter, it seems that either the coils are out of alignment or that the coils are faulty in themselves. If the set is correctly built and aligned according to the article, it might be wise to return the coils to the manufacturer for rechecking.

J.W.R. (South Brisbane) wants the layout of the T.R.F. set described in the October issue of "Radio and Hobbies."

A.: Sorry, but we are unable to supply you with a full-sized drawing of the layout for this set. You should have no difficulty in laying out your chassis if you follow the diagrams printed in the paper, as the measurements are all to scale. We find that the 6L6G is quite suitable to use with the 809, and there is plenty of drive available, under correct operating conditions.

W.T.C. (Stanthorpe).—A very successful way of eliminating most of the noise from the car engine from interfering with your portable set is to erect a fish pole aerial on the back of your car. A loop aerial inside the car will pick up ignition very effectively, and the extra signal strength made possible by the outside aerial will make all the difference.

R.L.H. (Woy Woy).—Since you are using an outdoor aerial, and your set comes up to normal volume when you place your hand near the aerial, we would suggest that you try an earth wire. Probably the capacity between your body and earth is enough to give the effect of an earth, at least, in part.

B.N. (Mt. Gambier).—Since all amateur activities have been suspended for the duration of the war, the information that you require would be of little use to you. We do not propose describing any D.C. or A.C. D.C. sets in "Radio and Hobbies," as there is little demand for them now.

J.C. (Chatswood).—The coils as used in the Duplex Single should prove quite satisfactory in your one-valve set. If you wish to construct them yourself, full details are in the Christmas issue of "Radio and Hobbies." If this set is carefully constructed, it should give you all the local stations, as well as the stronger overseas stations.

K.N. (Goolwa) wants to know the best material to use in building a small laboratory.

A.—Since you do not state whether you propose building this laboratory indoors or outdoors, we are not in a position to advise which material would give you the most satisfaction. However, any of the materials you mention should be suitable. We appreciate your kind remarks about the paper.

B.P. (Victoria).—Sorry, but the circuit you propose using is a very old one and would not give satisfactory reception from the modern stations now in operation. Why not build one of the simpler sets described in "Radio and Hobbies," as they are quite excellent sets to start off with.

C.C. (Summer Hill) wants to know if the Pentagrid Portable could be converted into a dual-wave receiver.

A.—As we have never tried this out, we are not in a position to say whether it would be successful or not. However, since the set performs so well on the broadcast band, there is no reason why it should not receive the stronger overseas stations, if a suitable dual-wave unit were fitted, and an outdoor aerial used. Glad to know that you like our paper.

D.P.L.G. (Broadview) wants instructions for building a portable set.

A.—As the June issue of "Radio and Hobbies," which described a four-valve portable, is now out of stock, we could send you our Christmas issue, which contains instructions for building a three-valve portable. Immediately on receipt of sixpence in stamps, we will forward you this issue.

E.W.E.B. (Crow's Nest).—Many thanks for your suggestion. Should we find it possible to include a section on model boats in "Radio and Hobbies" we will do so. Your kind remarks about the paper are appreciated.

R.M.B. (Geelong West) wants a copy of "Radio and Hobbies" in which was described a home-made microphone.

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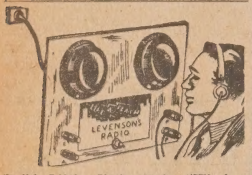
Presto, the Box Trick, the Bolt and Nut Puzzle, Jafet's Mystery Wallet, the Donkey Trick, Off With His Head, the Hindu Mystery, the Teasing T Trick, the Squarem Puzzle, the Shy Lock Trick, the Palpitating Plate Lifter, the Obedient Ball, the Cricket Bat Trick, the Vibrating Match Box, the Hindu Paper Trick, Tell Anyone's Age By Cards, Rubber Nuts. Write for Full List of Tricks, Puzzles and Games. The Come 7 Dice Trick, 2/9. The New Take It Apart Puzzle, 1/-. The New Siberian Chain Trick, 2/6.

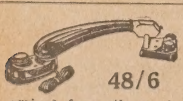
Play, Talk, Sing, Joke through your Radio. Great Fun.

B.G.E. Table Type Microphone. Highly recommended for Amateur or Professional use. Built-in Transformer and Battery, with Volume Control incorporated. Just plug into pick-up terminals of any set. 39/6.



Build Little Jim's Mate "Wireless Weekly" Battery Set. Charts and All Directions, 6d. All Parts, 21/5; Valve, 13/6; Batteries, 11/-; Phones, 10/6. Built, complete, £3/16/5.

Pick-ups for Radio Gramophone. 25/-, 27/6, 30/-, 32/6, 35/-, 38/6. Pick-up heads suit and fit all Tone Arms. 10/6, 12/6, 15/-, 17/6, 19/6.



48/6

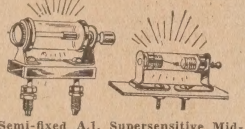
Just arrived from the maker in London. Cosmocord de Luxe Crystal Pick-up, with Incorporated Dual Volume Control, 48/6. Usual Price, 75/-. Write for full lists.

Totem Race Game for Clubs, Home Parties, etc. Push lever, then see winner and the winner's price. 21/-.

Special! Special! Military Mufti Brooches and Tie-pins, Air Force Wings, Engineers' Rising Sun, Ordnance, Medical Corps, Artillery, Signallers, Military Miniature Tie-pins or Brooches, enamelled and gilt, 2/3, post free.

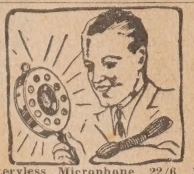
Like-a-Flash Cigarette Selling Machines for wall or counter. All Metal, Foolproof. Two Sizes. Holds 15 packets of 6d cigarettes. Price, 32/6. Larger Size, holds 24 packets. Price, 37/6. Match Machine, 37/6 — 1d operation, 24 box capacity.

Extendable 2 to 3 cell Torch.—World's best, 10/6. Focussing, dimmer, daylight globes, spare globe carrier. Finger on belt loop.



Semi-fixed A.1. Supersensitive Midget Crystal 2/6
Continental Crystal Detector . . 3/9

Cow-Boy Guns, just like the real thing. Flash coloured Handle Grips. 5/9, 6/6, 7/6. Automatic Types, 4/6, 4/9.



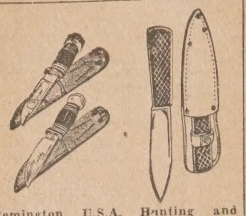
Batteryless Microphone, 22/6. Just plug into the pick-up terminals of Set. Sing, play, romp, recite, etc., etc. Suits and fits all sets. Send for full lists.

Fixed Carborundum Crystal Detectors, with mounting clips, 2/6, 3/6, 4/6. Glass Enclosed Crystal Detectors, complete, 3/6.

Microphone Units for Experimenting, in mesh-front case. Small Microphone Buttons, 4/6.

Radio and Electrical Meters. Send for full list. Pocket type reads A. and B. Batteries, 2/6, 3/9, 4/6.

"PIFCO" All in One Meter. Tests everything in Radio 25/-. A.C.-D.C. 0 to 30 milli amps. Valve and Circuit Tester. 0 to 6. 0 to 240 volts. "EMICOL" Bench Type Meter, 30/-. Complete with leads. 0 to 30 milli amps. to 60 to 150 volts. Also ohmages. French make.



Remington U.S.A. Hunting and Sports Knife, 10/6. Throwing Knives, as illustrated, 6/9. Other Hunting Knives, 5/6, 6/6, 7/6. All with leather sheaths.

Reliable Swiss Stop Watch for all Sports. 25/-.

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RADIO VALVE TESTING

Lecture by M R. W. N. WILLIAMS (of the A.W. Valve Co.)

THE fifth and final Radiotron lecture this year given to radio technicians under the auspices of the Amalgamated Wireless Valve Co. was delivered on the evening of Thursday, December 7, by Mr. W. N. Williams, of the A.W. Valve Co. application laboratory, at the Coronet Cafe, George-street, Sydney.

Mr. Williams, whose subject was Radio Valve Testing, introduced his remarks by pointing out the importance to servicemen of adequate equipment. He stressed the point that the readings of the average valve testing equipment could not be regarded as final. In the first place, normal equipment necessarily disregarded certain obscure characteristics; on the other hand, a fault in a valve did not necessarily prevent a valve from operating in a receiver. Hence it was desirable for a serviceman, wherever possible, to consider the readings given by the tester in the light of the particular function of the valve.

WHY VALVES FAIL

By way of amplifying this general statement, the lecturer discussed a number of reasons why radio valves fail, the tests which can be applied to locate the various faults, and the possible effects of those faults upon the performance of the valve in a receiver. In this connection he dealt with short-circuited and open-circuited electrodes, microphony, loss of emission, low mutual conductance, grid current and heated cathode leakage. In the case of certain types of valves such as frequency converters, power rectifiers and class B power valves, he said, it was difficult to devise a simple test which could show accurately the condition of the valve.

Mr. Williams outlined a number of tests which could be applied to those valves and set out specific test conditions suited to the majority of well-known valve types within this classification.

Summing-up, he said the need for adequate valve-testing facilities was obvious, but in the design or selection of suitable equipment a number of conflicting factors must be considered. From the foregoing discussion certain points emerged:—

(a) The mechanical arrangement of a valve tester should be such as to allow for future valve developments, particularly in regard to new types of sockets or to non-standard base connections.

(b) Some form of short circuit test having a sensitivity of approximately .25 megohm is imperative. A cold-cathode test is usually sufficient.

(c) The quality test should preferably be based upon a measurement of mutual conductance for all types other than diodes or rectifiers. For these an emission test is necessary.

(d) Where for reasons of cost a mutual conductance test is not feasible, an emission test may be used. In this case the meter should be marked simply, "Bad—Doubtful—Good," the "Doubtful" region corresponding to the "end of life" point as determined by one of the tests outlined earlier in the lecture.

(e) A gas or grid current test is desirable. Extreme accuracy is not necessary, but it should be possible to determine when the grid current exceeds the limits quoted for the various types of valves.

PROPER USE OF TESTER

Finally, said Mr. Williams, it must be remembered that the most effective equipment can do no more than locate a fault, but whether or not that fault would affect the operation in a receiver or amplifier was dependent upon the particular application.

In view of this a serviceman should always be willing to test a valve and offer an opinion on its performance, but should studiously avoid pushing a sale on doubtful grounds.

It was far better to lose a valve sale than a customer.

At the conclusion of his address Mr. Williams was asked a great number of questions, which continued until the lateness of the hour brought the meeting to a close.

A.: There are so many different ways of interpreting the word "oscillator." As you do not specify particular type, it is very difficult to give a definite answer. However, an oscillator might be described as any device that will produce and emit alternating radio waves or oscillations. Many thanks for your kind suggestions, which are very useful. We might mention that in the September issue of "Radio and Hobbies" we described a small home made microphone.

L.McG. (Como) asks several questions re Duplex Single.

A.: As the condenser that you propose using is probably an old type, it is hard to say how many plates should be taken off. However, the capacity of the condenser should be marked on it somewhere, and if it is and corresponds to .0003 or .0005 it will work quite well in the set. The Duplex Single should work any of the small Perm. Magnet type or one of the old horn type speakers quite well. The valve diagram is quite correct; there are two "no connections" on the base. If you follow the diagrams as printed in "Radio and Hobbies" in wiring up the socket, you will be quite safe. It is hard to say exactly what range the set would have in your district, but properly constructed should give you excellent results. Glad to hear that "Radio and Hobbies" has you interested.

H.A.J.B. (Mayfield West).—Thanks for your kind remarks about our paper. At the moment we do not intend having a section devoted to Chemistry, but should there be a large enough demand for a section of this kind, we certainly shall try to include one. Your idea for dropping bombs from model aeroplanes is certainly interesting, and we intend keeping the sketch for future reference.

S.J.W. (Two Wells) writes: "Noticing your paragraph asking for unusual servicing faults from readers, I thought the following, which is one of the most unusual that I have experienced, might possibly be of interest: The receiver, a Vibrator superhet, working from a 6-volt battery, had suddenly stopped. On investigation the output stage was operative, and the fault appeared to be in the R.F. portion of the "works." Checking all components revealed no fault, and on putting each valve in a receiver working from a 2-volt battery, all appeared to be 100 per cent. Scenting something a little unusual, I brought an analyser into action, and soon located the fault. The filaments of the five valves were connected in series parallel, and the drop across the ID4 was around 3 volts, and the voltages on the other valves were adversely effected to the extent that the IC6 was receiving insufficient current for it to oscillate. On inspecting the ID4 it was apparent that the filament had "gone west," and in so doing one piece of it had sprung across and arc welded itself in such a manner that about half of the filament was still intact and capable of working. The resistance of the filament was naturally much less than normal, which caused heavier current to be drawn with a proportionately higher voltage drop across it, leaving insufficient for the other valves. Putting the ID4 in a receiver working from a 2-volt battery, it just drew a heavier current than normal, but otherwise functioned quite well. Doubtless the filament remaining would soon have gone at the increased current."

V.P. (Kullee).—Your query suggests that either the valve is no good or else there is an open grid in the audio section of the set. Suggest you try these, and if the results are no better, to see your local serviceman. The information in your letter does not give us much to work on.

B.O. (Melbourne) wonders if 10 m.a. drain is too high for the R. & H. Portable.

A.: No. 10 m.a. is quite all right for this set. The current probably varies with the sets, with some the drain might be slightly more or slightly less than 10 m.a.

L.M. (City).—Probably the best books obtainable to study for the Amateur Licence are the Radio Amateurs' Handbook and the Radio Handbook. These are obtainable from any of the large booksellers.

M. O'C. (Wyandra).—Since you are situated 500 miles from Brisbane, you would need to build at least a 4-valve superhet. if wanted to obtain good reception. As it is very hard to recommend a radio book to a beginner, your best plan would be to write to any of the booksellers which advertise in "Radio and Hobbies," and they will be able to supply you with a catalogue of their technical books.

T.J.G. (Guluguba).—Yes, the standard T.R.F. Receiver, as described in the September issue of "Radio and Hobbies," could be adapted to use 2-volt valves instead of the 1.4-volt as described.

H. McG. (Brisbane) inquires for details of building an electric organ.

A.: Sorry, but owing to the technical difficulties involved, it would be entirely beyond the scope of "Radio and Hobbies" to attempt to describe the construction of a successful electric organ. Also such an article would probably interest only a few readers. Thanks for kind remarks about the paper.

E.M.A. (Subiaco).—You could use either air core or iron core coils in the Junior Radiogram Eight. However, the iron core type would probably give better results, if you do not mind the extra cost. Afraid that you could not convert the spring motor to an electric motor, as the construction of each type is entirely different. Glad you like our paper.

N.G.J. (Annerley).—The details of the Duplex Single coils are described in the Christmas issue of "Radio and Hobbies." These coils are identical with the coils used in the original Duplex Single.

G.S.N. (Nambour).—Suggest you get in touch with K-DEE Pty., Ltd., 561 George-street, Sydney, re model aeroplanes and equipment.

T.C. (Eden) wants to know if the "Little Jim" circuit from the April issue can be operated from batteries.

A.: A battery version was "Little Jim's Mate," detailed in our May issue, but we would recommend you to consider the latest "Duplex Single" circuit which appeared in our Christmas issue. This new "Duplex" could be built as a straight broadcast set if you don't want short-waves, and it should be ideal for your purpose. Reports received so far indicate that it is a grand little set.

A.L. (Broad Arrow, W.A.) is interested in "Little Jim's Mate," and wants to know if it would drive a loud-speaker if a two-volt accumulator was used, with a higher B battery voltage.

A.: Operated fairly close to a powerful transmitter a set of this kind is quite capable of operating a loud-speaker to a limited volume, and whether you consider it satisfactory reception or not largely depends on what you expect to get. If you are located more than 25 miles from your nearest broadcasting station we wouldn't recommend the idea.

QUERIES

J.K. (Western Australia).—Thanks for your suggestion. However, as all amateur licences have been suspended for the duration of the war, there would be no benefit in describing any transmitter circuits. Glad that you like "Radio and Hobbies" so much.

D.S. (Adelaide).—It is difficult to say which type of aerial would give you the best results, but considering your difficulty in erecting an outdoor aerial, it might be advisable to try an indoor one first. This can consist of about 20 feet or more of aerial wire tacked around the picture rail of your room. Normally this type of aerial gives good reception, although the signals will not come through as loudly as if an outdoor aerial was used. If it is not satisfactory, then you could try an outdoor aerial, remembering that its effective height will only be the distance from the top of the metal roof to the aerial wire. Let us know how you get on with the "Duplex Single."

H.E.B. (Trundle).—Station 2GZ would be received in New Zealand on the same frequency as it is received here, namely, 990kc. It would be tuned in about midway between stations 2UE and 2KY.

B.S. (Crabbes Creek).—Your accumulator could be damaged by charging it at 7 amps when it is only designed to take 6 amps. Thanks for your suggestion and kind remarks.

V.H.E. (Jung).—We hope to publish an article on Crystal Set Circuits, and probably in that article you will find a circuit to suit your own particular needs. Sorry, but we have no copy of a circuit employing the valves you mention.

G.B. (Hobby's Yards).—Your letter was quite interesting, as these stations are sometimes difficult to log. Although if one has enough patience and a good receiver, it is not uncommon to receive the stations on the broadcast band, providing conditions are favorable. However, very few people care to stay up until the strong local stations have closed down, just in the hope of hearing these stations. That is why we hear so little about them.

R.F.W. (Gerogery).—Afraid the air-cell would not be any good to use with the vibrator. The maximum drain on the air-cell is 65 amps, but the vibrator would need much more than this, and at 6 volts.

S.P.M. (Swan Vale).—We hardly think that your receiver has always been like this, and as you have not included much information about it, we would only be guessing if we tried to advise you of the trouble. The best people to refer to would be the manufacturers of the set.

C.L. (Paddington) requires details of the R.F. coils for the Senior Seven described in August issue of "Radio and Hobbies."

A.: Sorry that these details were omitted from the article. The turns needed are:—40-100 metres 30 turns ½ interwound, 16-40 metres 10 turns. Mid Range 5 turns. Use 32 gauge enamelled wire for these and wind on ¾in. diam. former.

R.I.P. (Dromana).—Yes, you could charge your battery from a wind-driven generator. However, we have at the moment no suitable constructional article on hand which would suit your purpose. Wind-chargers are quite good where wind is strong and consistent, otherwise they are unreliable.

Tiger Rag (Clunes).—The circuit of the vibrator unit was reprinted from the American magazine only as an article of general interest, and should not be taken as a constructional article. As far as we know, there is no vibrator unit obtainable locally that will work from a 1.5 dry cell. The C battery is the easiest way to obtain the bias voltages.

W.H. McD. (City).—Sorry, but we don't know what you mean by a Universal Motor. If you let us have more particulars we may be able to help you. The Economy Seven Battery set is a similar performer to the Master Six. The K12 is an electro-dynamic speaker and not suitable to use with a battery set. Try our advertisers, they might be able to supply a ready built set. Either a magnetic or crystal pickup would be suitable to use. We have no further information on the special pick-up, but understand that it will not be obtainable here. Cannot recommend the pickup you mention; it is tricky to handle.

Kookoo (Lake Illawarra).—Thanks for the nice letter. If the reaction worked before the set was put away, there is no reason why it shouldn't work now with the new valve. Suggest that you check over the wiring. In an early issue of "Radio and Hobbies" we intend publishing a list of resistors with their color code.

W.E.L. (Myponga).—Many thanks for your letter. We are quite pleased to hear that you have had such good results with the Dual Wave Advance "39." As your set is working quite O.K., don't worry about any shielded wire. If it hums at all it might be advisable to shield the wires to the volume control. Up to the present we have never described a portable set as dual-wave. We may be able to describe such a set in a later issue.

Short-Wave Correspondents

Ray Simpson's mail-bag will be dealt with each month through these columns. If you have anything you want to know about Short Waves, look for your answer here!

Mr. W. Silverthorne (Port Augusta, S.A.) has been very lucky with his verifications, recently having received 14 from various stations including a very attractive one from WNBI. Yes, the Manila do verify, but they are sometimes rather dilatory. Many thanks for list of stations you have heard.

Mr. P. J. Shields (Manly, Qld.).—Before you read this you will have received our letter answering your queries. Many thanks for your notes re the additional English sessions from various stations, which you will note we have included in the lists for this month.

Mr. P. Richards (Moore Park, N.S.W.).—We hope the information we sent you by mail was of use to you in identifying the stations which were puzzling you. These stations are still being heard well at our location.

Mr. A. Lee (Dubbo, N.S.W.) finds static troublesome at night now in his location; also the intense heat makes any intensive short-wave listening impossible. Will be interested to see the photo when it comes along. The writer will be on holidays from January 15, so may not be able to see you when you are in Sydney. Hope your converter dial has been fixed up now, as this type of trouble is very annoying.

Mr. John Butler (Bellevue Hill, N.S.W.).—We understand that Mr. A. Vogel, Bangerang, via Warracknabeal, Vic., has a verification card from JVW3, which was intended for you, and which he will be pleased to send on to you if you will drop him a line.

Mr. H. R. Cox (Cobden, N.Z.) has been having considerable trouble with his receiver, but expects it will be O.K. by now. Mr. Cox finds the United States stations especially very good now in the afternoons, even those up on the 49-metre band. We often envy you, as New Zealand is supposed to be the D X'ers paradise, though I also think that listeners in this country can also put up a good show.

"K. Mc" (North Fitzroy, Vic.).—Many thanks for your kind seasonal greetings, also list of stations received. While we admit the "S.W. Tuning Chart" may not be of interest to you, we believe it is appreciated by those listeners who only listen to the more powerful stations. Personally, we have never heard your mystery station on 28.5m., though we have listened for it on numerous occasions. No other reports of this station have come in from other readers, so we must just hope for the best.

Mr. M. Foster (Mount Vincent, N.S.W.).—Many thanks for the nice calendar, which was greatly appreciated. Another article on Verifications may appear at a later date, if there is sufficient demand. Despite your condensed listening time, your list of stations is a very extensive one.

Mr. B. W. Battis (Coraki, N.S.W.).—According to your list of stations, conditions must be very good at the present time in Coraki. Hope you enjoyed the coffee from Guatemala as much as we did ours. Many thanks for your Christmas greetings.

Mr. H. Medina (Waverton, N.S.W.).—Your list of stations received is one of the most extensive we have had submitted, and speaks volumes for your receiver, also your own enthusiasm. The only reason the German stations are not published is to conform with editorial policy on account of the war. Hope you succeed in identifying those other stations you have been hearing.

Mr. Vic. Oakes (Merbein, Vic.).—Pleased to hear from you, Mr. Oakes, and we have answered your letter by mail, which you will have received before you read this.

R.P. (Auchenflower).—The coils as used in the Duplex Single would be quite suitable to use in the set. These can be obtained from R.C.S. Radio Pty. Ltd., whose advertisement appears in "Radio and Hobbies," or full details for making them are in the Christmas issue of "Radio and Hobbies." Sorry, but the April and May issues of "Radio and Hobbies" are out of print. Thanks for your nice remarks about the paper.

N.S. (Ryde).—The 4/38 receiver would not be suitable to use with a pick-up. Regeneration is the action by which part of energy from the plate circuit of a tube is fed back into the grid circuit of the same tube. This allows a weak signal to be built up until it is effective as a stronger signal. It also increases the sensitivity of the receiver. The letters A.V.C. stand for automatic volume control, which allows a receiver to vary its own amplification in accordance with the strength of the received signal. The amplification automatically increases for weak signals and decreases for strong signals.

Resistor (Ravenshoe).—You could drop the voltage down from 2 volts to 1.5 by means of a resistor. Since you have not stated the current drain, we cannot advise you of the exact size. By means of Ohm's Law, you could calculate: Divide the voltage drop by current in amps and the result will be the required resistance in ohms.

H.S. (Carlton).—Sorry, but we cannot understand what you mean about the induction coil. If you would submit your query a little more clearly, we will be only too pleased to try and assist you.

W.S.L. (Brisbane).—The original article on direct coupled amplifier appeared in July, 1939, "Radio Craft."

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